DOCUMENT RESUME

ED 022 524

LI 001 028

PROCEEDINGS OF THE GOVERNOR'S LIBRARY CONFERENCE (1ST, ALBANY, JUNE 24-25, 1965).

New York State Governor's Library Conference, Albany.

Pub Date [65]

Note-65p.

EDRS Price MF-$0.50 HC-$2.68

Descriptors-ADMINISTRATIVE ORGANIZATION, *AUTOMATION, CONFERENCE REPORTS, *LIBRARIES, *LIBRARY COOPERATION, *LIBRARY PROGRAMS, LIBRARY REFERENCE SERVICES, *LIBRARY SERVICES, PROGRAM DEVELOPMENT

Identifiers-*New York

An invitational conference, attended by 200 library executives, practitioners and persons from allied fields, was held to explore progress and problems in library development in New York State. Special consideration was given to: (1) the application of data processing techniques for reference and research and (2) the improvement of information retrieval through cooperative use of public and private resources. Papers and panel discussions covered universal education and libraries; transferring knowledge for use; science and industry; library cooperation; automation and data processing; and national, state, regional and local organization for library services. (JB)

LI 001028

proceedings of the first Governor's Library Conference

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ED022524

LI 001028

JUNE 24-25, 1965
ALBANY, NEW YORK

STATE OF NEW YORK Nelson A. Rockefeller, Governor

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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proceedings of

THE FIRST GOVERNOR'S LIBRARY CONFERENCE

JUNE 24-25, 1965
ALBANY, NEW YORK

STATE OF NEW YORK
NELSON A. ROCKEFELLER, GOVERNOR
EXECUTIVE CHAMBER
STATE CAPITOL, ALBANY, NEW YORK 12204

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CALL FOR THE CONFERENCE

"I am calling the First Governor's Library Conference in New York State to explore progress and problems in library development for New York State with special emphasis on the application of data processing techniques for reference and research.

"The Conference will examine ways and means of improving information retrieval through the cooperative use of public and private library resources.

"With the proliferation of recorded knowledge in our rapidly changing world, it is essential that we develop more efficient means of meeting the consumer demand for information with a minimum of duplication of facilities and services. Although the Conference will give primary consideration to information retrieval, we shall explore progress and problems in other important areas of library development in an effort to seek solutions based on the application of modern scientific and technological advancements.

"This Conference will bring together approximately two hundred selected representatives from public and private educational institutions, foundations, labor and industry, government—the consumers of information—and public and private libraries—the providers of information. Community leaders who have an interest in the improvement of library resources will also be invited. The Conference will attempt to gauge the new requirements and the new services for reference and research which cannot be satisfied with traditional library methods. I look to the Conference also to provide stimulus and guidelines for State action in this important area."

Nelson A. Rockefeller

NELSON A. ROCKEFELLER
Governor

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Introductory

IN HIS ANNUAL MESSAGE to the New York Legislature on January 6, 1965, Governor Nelson A. Rockefeller, in a section on "Human and Social Concerns," announced a coming event of much greater portent than the public heed given it at the moment may have suggested. His words were:

"New York State has one of the most effective library systems in the nation. To make this possible, we have more than tripled State assistance for local libraries in the past six years.

"Progress in the development of library programs has been significant. To help determine how best to make use of the emerging data processing and electronic devices for more efficient storage and for easier access to reference and research materials, I shall soon call a Statewide Conference."

The prestige of libraries, and their broadening outlook, had come a long way indeed since World War II. This would be the first time that a Governor of New York State ever had summoned a major, high level conference to examine the situation of libraries and how it might be more rapidly improved with State assistance. That he had committed himself to sponsoring such a meeting was encouraging, of course, to library specialists of this State and beyond; and it held decided implications for the future in a State which already had been setting precedents in the acceptance of libraries as an integral part of the educational structure and as a governmental responsibility.

During the preceding 15 years, an overwhelming majority of New York's public libraries had been knitted together, step by step, into 22 cooperating systems, covering nearly the entirety of the State's geographic area and serving some 97 percent of the population. This had been achieved with the gradually expanding help of legislative enactments and appropriations.

Governor Rockefeller presently appointed an advisory committee of 18 members to plan the conference, naming his executive secretary, Dr. William J. Ronan, as its chairman. The organizing details were ably handled by another member of the Governor's secretariat, Edgar D. Draper, as executive secretary to the advisory committee.

The outcome was the First Governor's Library Conference, which took place on June 24-25, 1965, at the Schine-Ten Eyck Hotel in Albany. This was attended by approximately 200 invited library executives and practitioners, as well as persons from allied fields. Among them—in a deliberate effort to bring varying viewpoints into contact—were many besides professional librarians, such as educators, scientists, representatives from industries, and governmental officials.

While primary concerns of the conference were with electronic data processing and research library service, discussion ranged over the problems in the entire library field.

Governor Rockefeller personally addressed the opening luncheon, whose presiding officer was Dr. Edgar W. Couper, Chancellor of the University of the State of New York. That evening, Lieutenant Governor Malcolm Wilson presided at a banquet program. At the closing luncheon, the master of ceremonies was the Honorable Francis Bergan, Associate Judge of the State Court of Appeals, a long-time lay supporter of libraries and former chairman of a special committee to study the State's library resources for the State Education Commissioner.

Aside from these occasions, the conference took the pattern of panel discussions under two main headings, "Old Problems and New Demands," covering Education, The Humanities, Science and Industry, and "New Dimensions for Reference and Research," covering Automation and Data Processing, National and State Organization for Library Services, and Regional and Local Organization for Library Services. On each topic, a principal panelist presented a prepared paper, and a respondent followed up with comments upon his paper. At the conclusion of the second day's panel, time was allowed for some discussion from the floor.

The chairman for Panel I ("Old Problems and New Demands") was Dr. James M. Hester, president of New York University. For Panel II, on Friday, June 25, the over all subject was "New Dimensions for Reference and Research," and the chairman was Francis R. St. John, president of Library Consultants, Inc.

This publication presents the detailed proceedings—subject to routine editing—of the First Governor's Library Conference.

Thursday, June 24

Presiding: **DR. EDGAR W. COUPER**
Chancellor, University of the State of New York

OPENING PLENARY SESSION

"Library Development in New York State—Challenge and Opportunity"
GOVERNOR NELSON A. ROCKEFELLER

"Realizing New York State's Potential in Library Service"
COMMISSIONER JAMES E. ALLEN, JR.

Library Development in New York State—Challenge and Opportunity

GOVERNOR NELSON A. ROCKEFELLER

AS GOVERNOR OF NEW YORK STATE, I am delighted to welcome you to the First Governor's Library Conference. This is a unique occasion. It is the first time a Governor of the State has called a conference primarily concerned with improvement of library resources, the application of modern science and technology for the collection, storage, and use of this information.

I have invited a number of distinguished librarians to assist in the development of the conference and participate in its sessions. But this conference is by no means limited to librarians. Many of you here are leaders of business, industry, labor, agriculture, the professions, educators and government officials. You are here as responsible citizens seriously concerned about the welfare of this State. You are here because you appreciate the importance of improving the library resources of New York State.

Though the State's library resources today are outstanding in many respects, thanks importantly to significant advances in recent years, revolutionary developments in education, science, and technology demand major new steps. We must further strengthen our libraries. We must adapt them to changing conditions. I look to this conference to supply guidance for those steps.

I hope this conference will be as significant a landmark as the pioneering by Lieutenant Governor Malcolm Wilson when he was an Assemblyman, by which he and others established meaningful State aid to libraries in 1950. Now, State aid to libraries is important to advance both education and economic growth. During my six and a half years as Governor, I have, therefore, made recommendations by which State aid to public libraries has been more than tripled, from $3,200,000 a year in 1958 to $10,200,000 now.

So far as this principle is concerned, I'm sorry that I had to veto a bill 10 days ago that would have increased the State aid to libraries by 25 percent more. This bill, however, made no provision for financing its cost through increased revenues or reduction of expenditures elsewhere, and it is my responsibility to preserve a balanced budget. This bill also ignored a major question to be dealt with by this conference on a current study of the Department of Education: Whether additional funds of this magnitude might not be more needed for new projects in the library field. It is not only a problem of money. It is how best to apportion limited resources among competing demands and also how to develop new systems and approaches which will make more effective use of these resources.

I remember that when I was elected to the Governorship in 1958, in talking with Jim Allen about the problems in the field of education, he said that the costs of education would double every six years. Well, frankly, I have great respect for Jim, but I just could not in any way comprehend or accept that statement, although I didn't challenge him at the time because of my deep respect for his position. The truth of the matter is that exactly that has happened, that in 1958, the State was contributing $587,000,000 in State aid to local school districts. This year State aid to the primary and secondary schools will be about $1,180,000,000. Jim's prediction has come true.

The explosive increase in the number of students and the newer instruction patterns calling for intensified use of books, are flooding our public libraries with college, community college, high school and grade school students doing research and homework. Furthermore, the scientific and technological revolution has flooded libraries with an incredible mass of research source material.

Commissioner Allen's Committee on Reference and Research Library Resources reported, for example, that the world's presses print 2,000 pages of new text every minute and that 75,000 scientific and technological journals are regularly published in 65 languages.

How to store and retrieve the significant information in all this mass of material, to aid research and prevent wasteful duplications in research is a major subject for consideration by this conference. I hope this conference will also develop information and ideas for further perfecting the 22 regional library systems developed in New York State these past 15 years; for coordinating local special and regional public library systems with college libraries; and for further expansion and staffing of public school libraries.

No State in the nation has a greater need for access to information than New York. This State has 203 colleges and universities with 39,000 faculty members and over 500,000 students. This includes 69,463 graduate students—over 20 percent of the graduate students in the nation. Next fall's freshman class at State University units alone will total an estimated 43,406. This is 6,000 more than the entire State University enrollment in 1958. It is nearly five times the freshman enrollment expected this fall for the whole Ivy League.

So you can see the speed of the growth and the magnitude of the numerical problem that we're dealing with.

In addition to education, let's take the field of industry. We have 1,200 industrial research laboratories in the State of New York; nearly 45,000 manufacturing industries, 53,100 scientists, and almost a million professional workers.

We live in a world in which information is a vital resource. We are in the midst of an information revolution that will have major impact on our lives in the years ahead. It is especially urgent that we keep abreast of this revolution in the area of science and technology for a more productive society. The success of State, commercial and academic research programs will depend importantly upon the effectiveness of library resources in making available the required information to those who do the research.

Excellence in science and technology is essential to the continued economic growth of our State. It is a vital element in creating future opportunities for employment on which our State depends for continued prosperity.

It is my hope that this conference will recommend policies and suggest guidelines to enable the State to develop programs for solving the persistent problems as well as the new demands for more effective methods of collecting, storing, and retrieving information. If we are successful in our efforts, we shall not only have better libraries but, in the process, we shall be improving an important resource for a better and more prosperous society.

Realizing New York State's Potential in Library Service

DR. JAMES E. ALLEN, JR.

Commissioner of Education of the State of New York

IN OUR EFFORTS TO IMPROVE the educational opportunities offered the people of our State, we are continually aware of the importance of our libraries, and we welcome the opportunity, provided by the Governor at this conference, to consider the needs and plans for the further improvement of our library system.

The years of Governor Rockefeller's term of office have seen great strides made in education. Not only has there been massive expansion in numbers and facilities, but there has been, I believe, more innovation, with more promising new programs, and more attention to quality in our educational system, than in any other similar period in the State's history. The support and leadership of the Governor have been significant factors in the progress made, and the people of our State should be most grateful for his interest in advancing their educational and cultural well-being. I am grateful, too, for the broad support we have received from the Legislature.

It has been said that "A great library contains the diary of the human race." When the diary of these days has become history, the significant contribution of our libraries to man's successful adaptation to rapid and convulsive change will surely be recorded.

The importance of libraries to our society is being underscored today by a number of convergent trends:

- The soaring enrollments in colleges and universities, as well as in our elementary and secondary schools, directly increase the present demands upon our libraries and promise more readers for the future.

- The greater emphasis on independent study places a growing reliance on library services.

- The continuing population growth and change in our society challenge us to serve more readers than ever before. We shall need to make special efforts to reach out to people in urban areas. The critical problems of our cities, where there are large numbers of culturally and economically disadvantaged persons, pose a challenge to our libraries. We need to explore more effective ways of providing these disadvantaged people with meaningful library service which can open avenues of self-education and advancement for them.

- The tremendous expansion of knowledge in our times means that continuing education is an absolute necessity if we are to keep up with the new knowledge which scientific advances and social progress have revealed.

- The troubled character of the world situation requires that our citizens have a knowledge and understanding of other people and cultures. Libraries can be a door to such understanding.

- Shorter working hours are bringing more leisure time. Libraries can help to provide a wise use for this time.

- The emphasis placed upon research in industrial, economic, and social development underscores the need for the ready availability of fast and accurate information to all individuals and institutions who may have need for it, regardless of where they are located or what library connections they may have.

- The great technological developments of our day present tremendous possibilities for greater efficiency and improved service for our libraries. New devices and techniques for the storage, reproduction, transmission, and bibliographic control of information materials give us hope that we may yet be able to cope effectively with the masses of materials which are being generated at an exponentially increased rate. Equally significant, but yet to be exploited, is the promise which these new techniques hold for the wide-scale, formalized sharing and joint use of library resources throughout the State, and eventually throughout the nation and even the world.

When one seeks to assess the adequacy of our present library program in New York State, its ability to meet the increased load and the factors of change which face us, important strengths are immediately evident.

Taken as a whole, New York State has great library resources, (there are over 5,000 libraries), reflecting the very considerable strength of its universities, industry, schools, and communities.

The development of our public library systems in the last decade is of particular note. A cooperative structure has been built in which 660 libraries are members of 22 public library systems. These systems, serving 98 percent of the State, geographically speaking, represent probably the most advanced network of public library service in the nation. The New York State Library, with its Library Extension Division, constitutes both an important backstopping resource for libraries throughout the State and an agency for continuing leadership in library development.

Fiscal support is increasing. Local funds for public libraries have continued to grow, at the same time that a succeessful program of State grants-in-aid to public library systems has been developed. Federal grants in recent years have given impetus to public library construction and the expansion of public library services. This year, under the provisions of the Elementary and Secondary Education Act of 1965, federal funds will be available for school library materials; the passage of the Higher Education Act at the federal level will provide a further financial help for libraries in our colleges and universities. A library partnership, with federal, state, and local government and many private agencies each making substantial contribution, is already a reality.

In balance, one must acknowledge that, despite these strengths, there are some serious deficiencies in the library picture.

While the structure of public library service in New York State is virtually complete, much remains to be done if the program is to provide in all areas of the State the high quality of service that prevails in our best libraries. Many of the central libraries of the system need further strengthening if they are to serve adequately as reference centers for their regions. To ensure that our public library program is developing in such a way as to meet best the needs of the library user, the Education Department is now conducting an intensive evaluation of our public library systems. This study is due for completion in December of 1966.

There is a critical shortage of professional librarians. We need to explore methods for insuring an adequate supply for the future and better utilization of the personnel resources that we now have.

An area of serious deficiency is in school libraries. While many of our schools have excellent libraries, too many, particularly at the elementary level, have no library at all. Many of our local school boards fail to provide adequate budgets for the support of school libraries, with the result that large numbers of students simply are not getting the library materials and professional assistance they require. An intensive effort must be made to correct this situation.

Library service to patients, inmates, and staff in the State institutions is another critical area of deficiency. A recent study conducted at the request of the Interdepartmental Health and Hospital Council presents a five-year development program for these libraries.

There is also a need for the strengthening of our State Library. While some steps have been taken, the library still does not have the books and staff it needs to perform with maximum effectiveness its dual role as a reference center for government and as an interlibrary loan center to back up the public library systems, the school libraries, college libraries, and special libraries. Furthermore, despite considerable renovation, the State Library has for many years been hampered by a critical space shortage. We are delighted, therefore, with the prospect of a new building in the South Mall to house the State Library, the State Museum and Science Service, and the State Historian's activities. We are now working with the architects to develop the plans for this exciting new cultural complex. The State Library is a vital center of our State library system and it is essential that it be fully prepared to carry out its role. The strength of the State Library is of special importance as the reference and research functions of our libraries are increasingly emphasized.

We lack a cooperative Statewide structure for achieving full service in the reference and research library field. A program is needed which will build on the strengths of our growing public library systems and on the existing strengths in our college, university, and special libraries—tying all together in such a way as to make it possible to institute a schedule of coordinated acquisitions and to facilitate the identification of and access to advanced library materials. In many cases, libraries have not been able to take advantage of modern technological developments, often for lack of staff and funds, often for lack of a sufficiently large structure to utilize these advances.

In 1960 I appointed a committee, under the chairmanship of Richard W. Lawrence, Jr., to consider this matter. The plan recommended by that committee received wide support and attracted nationwide interest. The committee's plan has been a part of the Regents legislative program every year since 1961.

Since the Lawrence Committee made its initial recommendations, there have been a number of studies of the application of the proposed plan to specific regions, and a considerable amount of local interest has developed. In several instances applications have been made to charter regional reference and research library organizations to carry out cooperative ventures relating to research library services. It is my hope that the deliberations of this conference will help to promote positive action along the lines advocated by the Lawrence Committee.

In the improvement of library service, it is essential that all concerned—librarians, trustees, government, industry, and educators—plan and work together. Whatever success we have had in library matters has been marked by an unusual interest and cooperation on the part of all of the interests involved, including the consumers of the prospective services. This must be continued.

The State must exert strong leadership in its planning role to ensure that all resources—local, State and federal, and private—are mobilized in support of an effective library program.

We must press our efforts to ensure that all types of libraries are brought into a total service structure which can make real the potential inherent in the separate parts. The time is indeed past when we can think compartmentally of a "public library program," a "school library program," a "college library program," or even the program of a highly specialized private library. We need to acknowledge the interrelation of these resources and services; we need to plan from the vantage point of a library user, who cares little about the "type" of library, but a great deal about the ability of that library or that library system to supply his needs.

In selecting our primary goals, in charting our course in the year immediately ahead, no task is more commanding than that of building a reference and research library program which will link together the libraries of the State and which will employ the most useful techniques modern technology has to offer, so that they may better serve the needs of education, research, industry, government, and commerce.

These are times when the value of investment in education is coming clearly to the fore as a matter of state and national policy. Along with this must surely come a greater investment in our libraries, so that they may fulfill their role as centers of learning, information, and self-development.

Panel 1

OLD PROBLEMS AND NEW DEMANDS

Education
The Humanities
Science and Industry

Chairman: **DR. JAMES M. HESTER**
President, New York University

Universal Education and Libraries

DR. JOHN H. FISCHER
President, Teachers College
Columbia University

IT IS ONLY WITH DELIBERATE EFFORT and some imagination that we can recall, if we try hard enough, the time when educational issues and problems could be discussed without considering virtually everything else that was going on in the world. There was a time when one who sought seclusion and a quiet life had a fair chance of finding it in the classroom. The primary school teacher, whatever else her problems were, could usually count on being well insulated from controversy. Indeed, if she became too visibly involved in controversy, she usually was no longer involved in classroom teaching. The university professor, at one time, was considered to be doing his job best when he stuck to academic and spiritual affairs, centering his interests in the more classical subjects and leaving more worldly matters to those who were thought of as living in the real world, which the professor was not thought of as doing ordinarily.

On some less rewarding days, we in this present generation of teachers find ourselves looking back a bit nostalgically, and even enviously, on those days, but we never seem to have time to look back on them for very long. The likelihood that the academic community will ever know anything remotely akin to those earlier times would hardly rank high in any table of current probabilities. Education, for better or for worse, has become inextricably, irrevocably, a part of the world and everything of the world.

Every hope that modern man entertains, every competence he wants to develop, every effort he makes to cope with the problems that beset him, comes to depend ultimately on some form of education. Whether our goals are personal, political, economic, social, or cultural, schools and the means of education have become our chief instruments for achieving those goals. This is but another way of saying that, to an unprecedented degree, men and nations now depend not only for their advancement, but for their very existence, upon the systematic cultivation of the human mind, upon the acquisition of knowledge, upon the ability to learn, and upon the ability to apply the fruits of learning to every aspect of living. In a recent discussion on the problems of vocational education, the suggestion was made that we might be approaching the time when we will identify as the universal vocational skill—the one indispensable vocational skill—the ability to learn.

Any activity that so thoroughly permeates our culture, our consciousness, our concerns, in short, our whole lives, as education now does, can obviously be discussed from many points of view and at many levels.

We might consider what is meant now by the term, universal education. Surely, whatever it means is something very different from what Thomas Jefferson had in mind when he first offered his radical proposal that every child in Virginia should attend school for three years. Startling though that idea was in its time, Jefferson's vision has been overtaken by changes even Jefferson could scarcely have imagined. Nevertheless, the translation of the principle of universal education into practice went slowly and, despite the quickened pace of the last 30 years or so, our lag is still deplorable. Something like a third of our people are still not receiving the high school education that must now be considered minimal in our civilization. But a new sense of urgency is abroad in the land now, and we are saying with considerable frequency that universal education must now be extended upward and downward. We're speaking of work at the 13th and 14th years of schooling in the same way that we once spoke of the high school. At the same time, we're insisting on programs for three- and four-year-old children, at the preprimary level.

Education is no longer considered a privilege reserved for those who can afford it, or for those members of the poor who happen particularly to merit the advantages of education. We accept it now as a basic necessity of life to be made available as a matter of both public and personal interest on equal terms to everybody. The relevant variable now is not the economic or social condition of the family but the child's or the young person's capacity to profit from instruction. Nor are we as dogmatic in our assertions as we once were about variations in capacity to learn. The idea that only a minority of the human race is capable of higher education is by no means the self-evident proposition that we once thought it to be.

We have begun to re-examine educational universality in yet another way. Although the need for intense specialization continues to grow, it is becoming steadily more clear that the total educational task will not be adequately performed unless the tendency toward specialization is deliberately complemented by a vigorous effort to realize the benefits of broadly liberal education. It is not enough that students be equipped for their separate responsibilities. They must learn also to share the joint responsibilities of humanity and to prepare for membership in a community of wide boundaries and compelling common interests.

Closely related to the new concern about universal education is the demand that the power of education be used for important new purposes. This is not to say that we are about to abandon the traditional objectives of sharpening and furnishing the mind. On the contrary, it is the continuing relevance of the older purposes that accentuates the urgency of the newer ones. Among these newer purposes, let me mention particularly the new impetus to use education for the achievement of genuine equality of opportunity. But our notions of that equality of opportunity are now taking a new turn. We no longer view admission to school itself as the attainment of equality. Rather, we are looking upon school as an instrument to be used, deliberately used, to enable the student to achieve a status of effective equality in the larger world. To put it another way, we are more ready than we once were to accept the proposition that because of special circumstances, some students require unequal, that is to say exceptional, treatment in the school if they are to enjoy actual equality of opportunity beyond the school.

What is currently being called compensatory education is, of course, but an extension of a principle that has been respected and practiced for many years in regard to children suffering from physical or mental limitations. Only in recent years, however, have we begun to apply that principle, even in discussion, to children who are socially and culturally disadvantaged.

It is hard enough for elementary and secondary schools to live by this principle, but at the collegiate level it poses even more difficult questions. We are by no means certain of the best ways, or even of the effective ways, to deal with college freshmen, to say nothing of graduate students, whose previous education has left them unprepared to meet the standards of higher institutions. To call a student qualified when he lacks what he needs is not charity but deception. Yet, the issue is not resolved by simply respecting standards and rejecting students. Obviously, what is called for, at the very least, is a willingness to adapt our academic procedures and our institutional patterns in ways that will respond to the valid needs of students and to the requirements of society. There is growing evidence that this can be done without abandoning either the old standards of scholarship or the new standards of justice.

A further demand on education arises from the incredible increase in available knowledge. The consequent and obvious impossibility that any student can learn more than a small fraction of it during his years of formal schooling, and the equally obvious imperative that every person must be prepared to continue to learn for the whole of his life, impose heavy and perplexing tasks upon every school and college. I need hardly add, upon every library. The old dichotomy, whether it is better to teach students or subjects, is finally seen to be irrelevant and diversionary; but Spencer's query, "What knowledge is of most worth?" was never more crucial than it is today. To fail to come to grips with that question now, in schools and in libraries, is to leave essential decisions to chance.

The solution of the curricular problem will come from no single group of specialists, nor shall we dispose of it by trying to identify some irreducible group of essential facts or most useful books. The more promising proposals appear to be those which would design the curriculum not around the subject fields as blocks of established knowledge, but rather by using as foci for curriculum development the disciplines by which inquiry is pursued and knowledge is acquired. Kimball and McClellan* suggest four categories of what they call the disciplines of thought and action:

The discipline of logic and mathematics.
The discipline of experimentation.
The discipline of natural history.
The discipline of esthetic form.

Phillip Phenix,† who argues that education should lead to the enlargement and deepening of meaning, proposes that whatever is taught be drawn from one or another of the scholarly disciplines, that it exemplify representative ideas and methods of inquiry of those disciplines, and that it appeal to the student's imagination. Phenix then goes on to group the traditional disciplines, for his purposes, into six categories according to what he sees as the logic characteristic of each group:

Symbolics, or language, mathematics and "non-discursive symbolic forms."

Empirics, or the sciences.

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* *Education and the New America,* New York, 1962, pp. 297-302.

† *Realms of Meaning,* New York, 1964.

Aesthetics, or the arts.

Synoetics, or "personal knowledge" (and here I think he departs from the established disciplines to get into a less formal situation).

Ethics, or the realm of moral, responsible conduct.

Synoptics, including history, religion, and philosophy.

It seems to be evident that when decisions on the curriculum are related more closely to the process of learning than to particular bodies of fact to be mastered, more will be required than simple access to accumulated materials. The school and the student—to say nothing of the teacher—must then become aware of and must become active in the procedures of inquiry and in the ways of making and validating knowledge. This means, then, that the epistemologist, the psychologist, the scholar specializing in a single subject, all become the indispensable allies of the educationist. Moreover, if each new generation of learners is to receive help of the authentic and comprehensive quality that will be required for intellectual competence in the modern world, these people must remain the teacher's lifelong companions, and the teacher must be theirs.

So much for the tasks that are posed by the new demands of universality, equality, and the multiplication of knowledge. But if they are to be successfully attacked, we must be prepared for innovation in those activities which comprise what I think of as the instrumental side of the educational enterprise.

One area of such activity is the systematic scholarly study of education, of the purposes, processes, and institutions from which education derives direction, effect, and continuity. While there is cause for some satisfaction in the recent expansion of effort in this direction, a great deal more remains to be done. Too much of even the most impressive recent curriculum reform has lacked the benefit of either adequate philosophical justification or rigorous evaluation. The fact, which we have to accept, that a start had to be made somewhere will not excuse failure in the future to undertake the comprehensive efforts that sound experimentation will require.

We need, for example, far-reaching programs of inquiry into the phenomena of teaching and learning and their relation to personal and social development. We need to ask of any task with which a student is confronted not only whether he *can* perform it at his age, but whether the effort to perform it is the best use of the student's energy at that period in his development and in the total context of his life and his circumstances. The fact that a six-year-old can deal with very interesting problems in physics is by no means the equivalent of proving that a six-year-old ought to be spending his time on such problems in physics. Maybe he should, but who is to say so without much clearer demonstration of the relationship than we have yet had? Constructive responses to such questions call for knowledge, expertise, and wisdom. Sound answers will depend upon the interest, support, and commitment of most segments of the scholarly community and the assistance of many public and private agencies.

Another field with great potential power to further the attainment of educational goals is educational technology. We have done a good deal more talking about educational technology than we have done in application of it. What is most urgently needed is not so much the rapid multiplication and dissemination of technological devices, although I would not denigrate this aspect of the matter. What we need, rather, is a more perceptive examination than we have had of the ways technological devices and procedures can be used to enhance the capacities of people—of teachers and students, if you will—to teach and to learn.

The central question to be asked about technology in education is not how to treat materials, but how machines might be employed to maximize what men can do. Or, to put it another way, the object is not to displace the teacher but to magnify his power to teach. I should add here that I'm never very much frightened by the specter of technology displacing the teacher. I think teachers have already survived the greatest technological threat that has ever been posed to them. This is the invention of the printed book. If ever anything was calculated to put the teacher out of business, it should have been the appearance of the printed book. There is not much evidence that it has had that effect.

A third subject calling for attention on the instrumental side, is the whole process of policy formation in education. In higher education, the question is highlighted, now, by the current insistence of a number of students on changes—still only vaguely described, when they're described at all—in the regulations governing universities. In the public schools the disturbances over civil rights, the activities of many special interest groups, and a general uneasiness among groups interested in the schools also suggest difficulties of varying seriousness. The fact underlying all the symptoms is that the arrangements for the governance of our educational institutions were devised and substantially frozen long before the pressures of the present era were even imaginable. While it would be absurd to suggest that all our existing structures are obsolete, or that they aren't changing at all, it is only reasonable to assume that institutional patterns designed for the mid-19th century, and by which in all too many cases, we're still living, will be less than fully effective in today's situation. The presence of wholly new social forces, the concentrations of population, the expansion of enrollment, the new economic conditions, and sharply different conceptions of the role of the scholar, cannot be ignored, as we think about the ways in which our educational institutions ought to be controlled, ought to be governed, ought to be related to other institutions in the whole of society. They all argue for a radical review of our institutional arrangements, and for a willingness to make such adjustments as the new conditions are found to justify.

Finally, it remains to be said that an educational enterprise can be no better, no more effective, than the people who give it vitality. The manpower problem in education is already severe and it is growing steadily more serious. The most important people in any school —those who make the greatest difference in its performance as an institution—are, of course, the teachers. Recruiting, preparing, and supporting the work of good teachers is the most influential part of the whole effort to attain a productive educational establishment. Much more is involved here, of course, than hoping to entice all of the best students into teaching, and then assuming that our task is completed. That would obviously be both impossible and undesirable, to get all the best students into teaching, since not every bright person will necessarily make a teacher and since other professions have their claims on bright people too.

Two fundamental questions, however, in relation to teaching and the management of our institutions, must be faced in new ways. One is to find how to teach the art of teaching so as to ensure its practice in ways that will be of the greatest value to students and to society. The second is how to organize schools and other educational enterprises so as to conserve teaching talent and deploy it to obtain the most effective and efficient results. This is only in part a problem of manpower economics; it is essentially the question of how to respect and nurture the qualities that distinguish the best teaching—and the best teachers; how to distribute those qualities most wisely; and how, in the fullest sense, to make the most of them.

There are also, of course, difficult questions of educational leadership—of finding the people and the procedures that will strengthen our institutions as cooperative entities; of improving the ways institutions are related to the economy and politics of our society; of using the skills of management to secure, in the best sense, the purposes of our people.

Let me, now, throw out to you a few questions that may bear directly on the relationship between libraries and education. There are questions that have to do, for example, with the whole problem of the widening universality of our educational efforts. Here the implications have to do with the range of materials with which libraries must be concerned. With the range not only in substance, but in degree of sophistication. Because if you who serve in the libraries are to join with those of us who serve in the schools, (and I should not say if you are to join, because we are obviously already joined in this enterprise), we must be concerned for a range in the capacity of people to deal with materials just as we are concerned with the range of the substance of the materials to be dealt with.

There is also another question bearing on this problem of universality and that has to do with the availability of access to materials; and here I am talking about much more than the mechanics of getting a particular book or other item of material into the hands or before the eyes of the person who is interested in it at the moment. I'm speaking also of the aesthetics of the situation. I think it would be a sad thing for us if our libraries or our centers for information storage and retrieval were to look like nothing more than the rooms that house computers. This is not to say that there's anything wrong with computers. Perhaps this is a nostalgic notion of my own—but there is a defense to be made, and perhaps an offense to be mounted, for the protection of the aesthetic values that are associated with the library and with all of the humanitarian values that the library suggests and has promoted over the years.

We must be concerned here, also, with the varieties of motivation that bring people to libraries. Whether we're speaking of the small community library, whether we're speaking of the library in the most advanced graduate professional institution, or in the most specialized industrial or research establishment—we cannot maintain our institutions at the level of service and effectiveness that we need unless we are concerned about the inner motivation that brings the person to us to use the facilities that we have.

On the problem of equality and all of its implications—there are a number of elements that deal with your work. There is, for example, the business of the cultural differences among people. You may say this has something to do with the problem of universality, but I think you would agree with me that the benefits of libraries have not always been equally available in any real sense to those people in the lower levels of our cultural distribution in the same sense that they have been available to people in what we might call the upper levels of our cultural distribution. There are here differences in outlook, differences in ambition, differences, if you will, in motivation.

There are also the differences that have to do with rural communities, with urban communities, with suburban communities. There are the differences between school libraries and libraries of many other kinds. It's pointless to teach a child to read unless you also place him in a situation where he has the opportunity to choose among books that he might wish to read, and has the opportunity to learn what it is to make a choice with respect to materials that he will use.

We need to be concerned not only with the expansion of our holdings in the fields of the sciences and in technology, where to be sure we have the deluge of new problems with which we must deal. There is also the problem of maintaining whatever balance seems most wise. There is the matter of remembering that not everything that is most urgent immediately is necessarily the most important. And some of the things which are oldest in human knowledge are still the most important. Let us not give way too quickly before the demand for currency. Let us remember that the ancient also has current value.

RESPONSE:

DAN LACY
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American Book Publishers Council, Inc.

EDUCATION ABSORBS the overwhelming majority of library services in this country. It also absorbs very nearly a majority of the entire output of books in the United States. Hence you could almost say that the problems of libraries and education are coterminous. When you speak of education, you cover the whole gamut of library problems.

Dr. Fischer has pointed out that we have a lot more people, we keep them in school a lot longer, and we try to teach them a much more comprehensive body of subjects. We try to teach them above all to learn for themselves, which means that we encourage their independent inquiry in libraries. As a result of these multiplying factors, we have an overwhelmingly increased load on the library services of the country: school, university, public, and research.

The last decade has seen a revolution in both the public and the educational administrative conception of the role of the school library. A decade ago it was the sort of humdrum menial necessity of the high school and the marginal luxury of the elementary school in most of the school systems of this country. I think all responsible educators now are likely to view the school library as the core of successful instruction. Society is responding to this new conception. The pouring of money into school libraries has been dramatic in the last few years. The $100,000,000 a year authorization in Title II of the new federal Elementary and Secondary School legislation will greatly reinforce state and local school funds.

Even though we have put our feet at last in the right path with school libraries, there are problems beyond those of more money and more staff. Dr. Fischer mentioned recognition of the necessity of compensatory education to make amends to hundreds of thousands of children in our society for the injury that society has done them, and the cultural and economic deprivation in which they have been brought up. Our school libraries, like our other school services, have hitherto responded to the demands of parents, rather than to the needs of children. By this is meant that the school libraries of upper-class suburban schools whose children come from book-rich homes are likely to be book-rich schools; and the school libraries of the core cities of the country where the children are likely to come from bookless homes are likely to be bookless schools.

In New York City, the elementary schools had substantially nothing in the way of elementary school libraries until recent years—on might almost say recent months—in contrast to the richness of the suburban schools and elementary libraries surrounding New York. Now monies can be made available both from Title II and from Title I of the federal Elementary and Secondary School legislation for this sort of purpose. In addition, city and state funds are being increased, though less dramatically.

We have a real intellectual problem here: the school library that is addressing itself to the needs of children who have had little or no contact with books—who come from quasi-literate homes, who have weak educational motivation, and very frequently retarded reading abilities (that is, reading abilities that are below their grade level); and children of narrow and meager social experience. This library has a very different kind of job from the suburban school library systems where most of the doctrines of school library service and the professional concepts of school libraries were formed. And I think we have a major intellectual problem in the devising of effective elementary school library service in core cities; just as publishers and their editors have a major intellectual problem in the developing of materials that will be useful for this purpose. This problem becomes especially acute when we consider that the school library system may well find itself tackling or providing preschool kinds of library services in terms of reading readiness preparation, rather than in terms of actual reading, and perhaps supplementary educational centers similar to Operation Head Start. So that we have, I think, not only an enormous fiscal and operational problem, but a very substantial professional and intellectual problem in accommodating the school libraries of the State, and especially of its larger cities, to the responsibilities that we expect the school system to serve.

Moreover, I think we ought to recognize that the principal school libraries in the country are public libraries in the sense that school libraries in general are accessible to any given child for only an hour or so a day, when he's not committed to being in a classroom. So that a very major part of all of his school-related library use takes place in the afternoon and evenings and weekends in his public library, which has not had the opportunity to think through the development of its collections in terms of close curriculum support, as a school library may have had; and which has lacked money for that purpose, because even the relatively much more limited federal funds available for public library support have not been calculated or allotted or planned in terms of the public library's function as the afternoon, evening, and weekend school library of its community. I think we need patterns of aid to public libraries that will recognize their school function more clearly; and, of course, patterns of much closer coordination of school and public library service; and perhaps exploration of means of making public library holdings available for more hours a week.

Turning to the implications for higher educational libraries, here the impact is really more dramatic even than at the elementary and secondary school level. The transformation of our social practice as to how long education continues has had its major impact at the college level. The change in the number of children going to high school has not been nearly as dramatic as the change in the proportionate number going to college. College enrollment has been shooting up far more rapidly than in any other part of our educational system. Broadening of curriculum, as dramatic as it has been at the high school level, has had an even more dramatic impact on library needs at the college level.

If you had two university systems, both in existence for many, many years, one teaching 10,000 students and one teaching 5,000, you might assume, properly, that the larger one would cost about twice what the smaller one did. But if you move a university system up from teaching 5,000 to teaching 10,000, over a period of two or three years, you're going to far more than double your library cost, because you're dealing not only with maintenance costs, but with the capital expenditures of setting up a new initial library system.

Now this has been happening all over the country. We have created hundreds of new higher educational institutions. We have remade hundreds more—taking the old-fashioned normal school and frequently making it a liberal arts college, promoting colleges to universities, adding whole new departments of Asian studies, Russian studies, etc. Each of these changes involves not merely maintaining a library, but creating a whole new area of library service with enormous capital expenditures at a much higher per capita expense than we've had before.

It is also of some significance for libraries that the doubling of college enrollment in the last few years has, for the most part, taken place in the library-poor institutions. These extra millions of kids have gone into the new schools—the suddenly enlarged schools, the schools which only now are beginning to address themselves to strong library service. So that we have a peculiar need there that goes beyond anything that you could measure by simple increase in the number of students.

We ought to make a rather specific distinction between the library needs for sustaining ordinary undergraduate instruction, at the one extreme, and the library needs required for doctoral and postdoctoral research needs, at the other. These are really quite different, and the measures we need to address to them are different. Even an institution like Harvard with a multimillion volume main library at Widener, found that even to sustain Harvard's superlative level of undergraduate instruction involved, for the most part, the intensive use of a relatively few tens of thousands of titles which could be more efficiently segregated and administered as part of the Lamont Library.

I think sometimes we can get a defeatist feeling of all but surrender in the face of the impossible demands that would be presented by trying to give all of our millions of college students access to this overwhelming flood of documentation that exists in the world today. But, as a matter of fact, the real fundamental, day-in day-out, bread-and-butter problem of college librarianship is not that the presses of the country are turning out 2,000 pages of text an hour; it is that 18 and 19 years ago, when the men returned from overseas and the war, the mothers of America stepped up their production of children from approximately 300 an hour to approximately 500 an hour during a one-year period, and we reached a social decision to send not about 10 percent of those on for higher post-high school education, but about 50 percent. The problem is not really that knowledge has exploded, it's that people have.

It is not an unmanageable number of titles of books that are required to provide the library support for really excellent undergraduate education. We are thinking not in terms of millions, but in terms of tens of thousands or fifties of thousands. Millions of documents are printed annually, but the books that are really serviceable for excellent undergraduate education produced in a year are still numbered in terms of relatively few thousand. There is no need for a defeatist feeling in connection with providing basic, satisfactory undergraduate libraries. What it takes is money. Money to build libraries and to buy books and to hire librarians. We really know how to run undergraduate libraries. We have the techniques and all of that available. It's not so much an intellectual problem as it is just deciding whether or not, indeed, we are going to do it.

I think we would delude ourselves if we thought that interinstitutional cooperation or automation was going to contribute any very significant amount of assistance in achieving library support for undergraduate education. It is of practically no avail at all to a student who wants to get hold of a copy of Conrad's *Lord Jim* in his undergraduate library in Keuka College, let us say, and finds that every copy is out, to know that the Colgate University Library has a comprehensive collection of first editions of Conrad. What he needs is a book—there on his campus, right then. Interlibrary loan really can't satisfactorily meet that problem—and automation can't either. What we need to do is to decide we are going to provide our college students with the kinds of libraries college students ought to have, and appropriate the money, and do it.

Running research libraries is a very much more complicated problem. Here you are dealing with a very much lower level of use over a vastly wider collection of material at very much higher costs. This State has so far been able to escape a lot of the burden of that. It has never undertaken to maintain the kind of library for doctoral and postdoctoral research that, let's say, Illinois does at the University of Illinois, California does at Berkeley, or Michigan does at Ann Arbor, or North Carolina at Chapel Hill. It has been able to rely on the excellence of privately supported research libraries like those of Columbia, Cornell, or The New York Public Library to provide the State's main core of this sort of need. There is room for the State to take a much larger role in supplying research library resources.

We should recognize that this, when we are dealing with advanced research materials, is essentially a problem beyond state or even regional mastery. The research library resource situation of the country is essentially a national problem. Its solutions necessarily have to be conceived on a national scale. But I think the successful implementations of any national program are going to require a very vigorous participation by research institutions scattered throughout the country, and cooperative activities of various sorts. Because the principal research institutions of this State, as it happens, are not primarily publicly supported and hence not necessarily committed to involving their resources in so comprehensive a scheme. I think one of our major problems of statecraft in this State is devising an effective means of bringing the resources of the State to bear on the problem of the adequate sustaining of research library resources whose availability will extend beyond the institution in which they are housed. This is a tough, difficult, and thorny problem.

I hope that, in our discussions here, we will take a realistic view of the contributions that automation and computers and mechanized electronic data storage and retrieval systems can make to this. In this connection, I'm inclined to draw an analogy. We have all recognized that the jet plane has revolutionized transportation, and has made all sorts of things possible in the way of getting from one place to another that were impossible even 20 years ago. It has, however, contributed remarkably little to the problem of getting from Larchmont into New York City, or indeed getting through Times Square at the theater break hour at 11:00 o'clock in the evening. The jet plane has a bright future. Undoubtedly, within the next five or ten years, we will have in effective use a supersonic plane whose speeds will be two or three times those of jet planes today. And for that sector of our population that really needs to be in London in two hours instead of six, this will make a tremendous difference. But it would not be a wise State administration that deferred action on getting from New Rochelle into New York City to see what the new developments in supersonic jet transport were going to do for transportation.

Now, to some extent, I think this applies in developing our higher level library resources. There are going to be enormously important contributions that computers and their electronic cousins can offer. Probably these will relate more to bibliographical control than to the actual production of texts, and probably they will relate more to the facilitating of the production of book catalogs than they will to being themselves an instrument that students or researchers consult to obtain information. But even at the most optimistic assumption of their possible uses, they will not enable us to get by on the cheap in solving the problems that we have of providing adequate informational resources. The experience, I think, of everyone who has applied any of the newer technology to the control of information is that it does not save money. By spending a great deal more money, you can achieve a good many things that perhaps you could not have achieved otherwise.

Meanwhile, our problems are immediate, urgent, in increasing library resources for the conduct of education in the State. I think the bright promise that automation has for increasing the effectiveness of our control of information would become a burden if we allowed it to be an excuse for deferring attention to those problems whose solutions we can understand and see, and which it takes merely means and resources to tackle.

On Transferring Knowledge For Use

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I SHOULD LIKE TO TALK with you briefly about some of the problems of transferring technical knowledge from the scientists and engineers who generate it to the industrialists, public officials, and other decision-makers who use it. By concentrating on that theme, I mean to exclude from consideration one important related area of concern, and I specifically do not mean to exclude another.

I do *not* mean that science and technology yield the only knowledge worth bothering about these days. On the contrary, I have been arguing recently that our galloping technical mastery means that we are once more up against the problem that the old Greeks, the dead Greeks, worried about: how to become wise—how to know what we want to do, and should do, now that we near the point when we can do almost anything we want. But I believe that we will make progress with these ethical and philosophical problems only as we learn to use our technical knowledge efficiently. Our problem of wisdom differs from that of the Greeks in two respects: it is more urgent, because we have so much more power than the Greeks had, and it is more likely of solution if we can take full advantage of the power that we have. Efficient transfer of our technical knowledge for use, therefore, seems to me a first indispensable step to effective wisdom.

What I do exclude from specific consideration today is the set of problems commonly grouped under the rubric "scientific communication." Scientific communication is by and large understood as a problem of documentation, and becomes more and more acute as the volume of scientific publications strains storage and distribution channels, as well as the time and retentive capacities of scholars. Broadly interpreted, documentation comprises problems of storage, retrieval, and dissemination of information. Mechanized cataloging, specialized journals, and expanded indexing and abstracting services are among the means designed to insure proper storing and dissemination. Computer programming, improved coding, and formalized selection procedures are used to aid the retrieval process. The problem is a massive one, and is deserving of the considerable research and resources it commands.

Yet research and resources devoted to scientific communication are mainly concentrated on making information *available,* chiefly within the scientific community. They feed the enterprise of generating technical knowledge. Much less effort and attention are given to *transferring* technical knowledge to nontechnical users, and to enhancing the capability of nonscientists to receive and assimilate scientific information for their own and society's practical purposes. It is a plausible hypothesis that resources are wasted to the extent that such transfer fails or is delayed. The existence and difficulty of problems of transfer too often receive nodding acknowledgment while systematic thought and resources continue to go into the allied—and conceptually less difficult—problems of documentation. My purpose today is to suggest that the balance should be redressed.

Improvement of communication between the scientist and the nonscientist depends in part on the possibility of developing an effective translation capability from the language of the one to the language of the other. It is not translating from one natural language to another that is at issue, nor from one mathematical or logical language to another. The problem is rather to "translate" between different temperaments, different attitudes and values, different ways of looking at problems. The nonscientist knows what his problems are, but he rarely knows just what kind of technical information he needs to solve them. He often does not even know that he needs any. On the other hand, the scientist himself is rarely equipped by temperament, training, or experience to recognize either the form that problems take in other than scientific fields, or the potential pertinence of his work to them.

This is not a major problem in scientist-to-scientist communication, because scientists in large measure share a common background. Increasing specialization and diversification within science tend to spawn a multiplicity of scientific dialects, but there remains an essential community of language among scientists, as there does among professionals in any field. The scientist either knows ahead of time exactly what information will be useful to him, or is in a position to recognize it when he sees it. His problem—the one to which documentation specialists are attending—is to find efficient means of sifting a lot of material until he finds what he wants. It is this community of language that seems prerequisite to formalizing communication procedures to the point that they can—at least in principle—be handled by machines.

There is not at present such a community of language between the technical and other sectors of society.* In the long term, education may develop such a common language where none now exists. In the shorter term, the solution would seem to lie in developing some form of combined man-machine system of communication in which the human contribution is *in principle* not further reducible. This remains essentially an intellectual problem, but its nature is marked as much more social than merely mechanical or logical. The techniques of the social scientist would seem required to solve it, in combination with those of the mathematical logician and computer engineer. And a modern concept of library operation might provide the most fertile ground for their cooperation.

Alvin Weinberg, the director of Oak Ridge, has stressed the importance of specialized information centers as a potentially "dominant means for transfer of technical information." He has described the specialized information center as:

> "A technical institute manned by working scientists who make it their business to know as much as possible about a certain specialized area of science, and who critically compact, review, and synthesize information, for the technical community. The input of the specialized information center is documents and uncorrelated data; its output is reviews, correlated data, and compilations . . . It uses the tools of the library and it cannot function without support of librarians, but its point of view is that of the scientist." †

Weinberg is clearly still in the context of scientist-to-scientist communication, but it should not be difficult to extend the idea to include professionals of different disciplines and social sectors serving as an expert communication channel for the transfer of scientific information to nonscientific users. There is a bold and imaginative plan afoot at the present time to establish a massive international center in Deauville, France, to attempt just this sort of thing.

Another idea, for effecting transfer of scientific information to industrial users, is inherent in an example given in an article by Economist Robert Solo published about two years ago:

> "The quality of the executive teams sent by Japanese companies to visit the Oak Ridge installation was many times commented on. Each team represented a carefully selected grouping of functional responsibilities in the firm and of technological and scientific competence with respect to the various aspects of the nuclear science and technology. Each team covered the operations and the research at the National Laboratory with insight and thoroughness, and probed the ideas and experience of officials and of scientists critically and systematically.
>
> "No groups even remotely comparable have come to the National Laboratories from U.S. industry. American businesses have told Atomic Energy Commission officials that they learned most about the new nuclear technology from such foreign teams who visited them after viewing the Commission's installations." *

All such schemes, of course, depend on the ability of the people in the system, not to act merely as passive transmission belts, but to collect, assimilate, and above all to transform information for new uses. Genuine communication is creative of something new, as students of the subject have often noted. Amelioration of the transfer problem would thus depend on systematizing (by which I mean more than just "mechanizing") this novelty-creating or fundamental translating capability in instruments of communication already existing or yet to be developed.

Attempts to deal with the increased need for technical information, of course, can not await longer-term solutions based on systematic study of the intellectual dimensions of the problem. Large industrial and military organizations have already added research and engineering departments to their staffs. Smaller firms have undertaken common research and development programs. The technical press has undergone major expansion of both its coverage and competence. Operations research groups devote themselves directly to problems of science for use. Professional consulting, finally, has become a way of life, as companies, armies, and governments seek to understand the enhanced implications of science and technology for their own objectives.

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* See proceedings of 1961 DSIR conference: *The Problem of Communication*, H.M.S.O., London, 1962; pp. 3, 11, and *passim*.

† See "Science, Government, and Information," The White House, January 10, 1963, p. 33; and A. Weinberg, "Scientific Communication," *International Science and Technology*, April 1963, p. 67.

* R. A. Solo, "Gearing Military R&D to Economic Growth," *Harvard Business Review*, November-December 1962, pp. 58-59.

All such measures have been useful in helping to transfer scientific information to nonscientific users for practical purposes. They are, however, institutional rather than intellectual attempts to solve the problem. They do not aim at systematic translation in the sense I have been indicating. They arose, by and large, not as products of communication research, but in response to immediate pressures for accelerated technological innovation in various enterprises, and they are essentially measures arrived at by common sense and trial and error.

I do not mean to say that they are not good methods, or that they are necessarily only *ad hoc* and interim to the elaboration of different, more rational ones. For it may be that the problem of effective transfer of information from the scientific to the other communities of the society is not principally an intellectual problem at all. It may be principally—and certainly is to a large extent—economic-political, a problem of devoting more resources to the task. We are now, on rough estimate, devoting 80 percent of our expenditures on science to *generating* information and 20 percent to *communicating* it. It may be that the essence of the communication problem lies in this proportion. It may be that the proportion should be nearer fifty-fifty.

On such an assumption, existing instruments and methods of information transfer may need, not so much to be improved or replaced, as expanded and multiplied. If the essence of the solution lies in a doubling or trebling of the money and trained manpower devoted to information transfer, then the problem ceases to be chiefly intellectual and becomes instead one of allocation of resources, and of explicit political decision to spend public monies in different ways.

Certainly not enough thought and resources are currently devoted to the problem, in either its intellectual or economic-political aspect.* Current means of intersector information transfer are inadequately combed for principles in terms of which they might be rationalized. There is no systematic evaluation of (for example) industrial research departments, operations research activities, and professional consulting practices *as instruments of communication.*

There is certainly insufficient experimental activity with systems (man/machine) designed specifically to translate science for the nonscientist. Few (if any) organizations devote programs to coordinating and enhancing the efficiency of the transfer process. The consequence is that, for want of the improved knowledge that such efforts might yield, decision-makers have inadequate basis for deciding whether major new resources should be devoted to communication, and inadequate guidance for allocating such resources even if they should decide in the affirmative.

In the transfer process, the contribution and responsibility of the *receiver* or user of the information are critical. It is this factor above all, perhaps, that distinguishes the peculiar problems of transfer from those of documentation. Solo, for example, reminds us in the article I quoted from before, that the same science, the same inventions, the same technical ideas have always been available to Asians, Africans, and Indians, as to Russians, Europeans and Americans. How does he account for the contrasts in progress?

> "There are two sides to transmission; publication *and search,* stimulus *and response,* promotion *and assimilation,* teaching *and learning.* There is a giving and a receiving; and the receiving also requires effort, skill, and organization. In fact, the rate at which national economies have grown and their technologies progressed has depended not so much on their capacity to generate scientific advance, discovery, and invention as on their capacity to assimilate and absorb, to respond and adapt to the scientific advances, discoveries, and inventions that are available" (p. 58).

Transfer, in short, depends essentially on the effectiveness with which information can be pried out of the scientific community and absorbed by the society. This is done now, of course, as the example of all the scientifically and technologically advanced nations of the world shows. But the evidence is mounting that it is being done very inefficiently, and that the gains from investment in science and technology could perhaps be increased spectacularly if only what were learned were more completely transferred, and therefore also more completely used. As even the most advanced countries of the world worry about their rates of growth, and as they devise programs individually and in cooperation to increase them, they might usefully decide to devote some very few resources to learning more than is now known about how the billions of dollars of science they buy can be more effectively exploited to achieve their objectives.

My choice of the phrase "some very few resources" is considered. In every research and experimental program, the first stages yield far more information and cost far less money than later stages. Since research and experimentation in the problems of transferring technical knowledge to its ultimate nontechnical users is now virtually nonexistent, there is no question of committing large resources to them now, suddenly. The question to be considered is rather the desirability of a modest, first-stage research and experimental program.

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* "Not enough" does not mean "none at all." The problems dealt with in this paper are not unrecognized. There are many individuals and organizations attempting solutions to them. These efforts, however, seem partial, uncoordinated, and inadequately supported, which itself is evidence of the needs pointed to in the text. It should be noted again that the problems under discussion are specifically those of transfer, not of documentation.

What might such a program include?

1. Alvin Weinberg says that more first-rate scientists should devote their efforts to communication. *A program might include inducing three or four eminent scientists to devote a year to the special problems of information transfer.* They could do research; they could design an experiment; they could tackle the communication problems of an industrial firm. They could do anything they deemed useful, for that year, provided they did communication.

2. A recent White House conference report has said that "the technical community should give higher status to the reviewer" (p. 27). *A program might include annual cash prizes for the three or four review books or articles that a panel of scientists, economists, industrialists, and editors of the technical press judged best from the point of view of information transfer.* Nothing would be calculated to attract first-rate talent to the problem faster than to have the first prizes earned by people of established reputation.

3. There is growing appreciation of the effectiveness and promise of specialized information centers. *A program might include setting up, as perhaps a 3-year experiment, a specialized information center adapted to the special problems of information transfer.* Adaptation might involve including scientists, economists, industrialists, and perhaps government officials, public information experts, and scientific journalists in such a center. They could concentrate on a small, well-defined sector of the problem, until their cooperative effectiveness was tested.

4. I have noted the potential effectiveness of mixed executive-technical information-gathering teams. *A program might include an experimental team to concern itself for perhaps two years with exploiting some single set of related scientific disciplines for the benefit of some particular economic program.*

5. I have discussed the requirement for a special kind of translation capability for information transfer. *A program might include an experimental training course designed to breed the new kind of information specialists needed to effect this translation.*

6. Continuing research and evaluation are necessary to support experimental activities of these various sorts. *A program might include (doing, supporting, promoting, coordinating) research and analyses on various aspects of information transfer.* Such a research activity could also serve to explore opportunities for increasing the efficiency of scientific communication in general by coordination and perhaps pooling of current institutional efforts. It has been proposed, for example, that different research institutes serving the same industrial sector might be formed into coordinated networks in the interest of faster and more complete information transfer.

It is clear that these six suggestions have been drawn from my discussion today. I have not considered them carefully, nor have I evaluated them against alternatives. It is equally clear that even a first research and experimental program in the problems of information transfer will have to choose its projects carefully rather than casually, and that those I have suggested have descriptive rather than prescriptive force.

It seems clearest of all that a moderate initial investment in a program of this general sort might very greatly enhance the economic return from investment in science and technology, and that serious and immediate attention should be given to the desirability of undertaking it. I have just read that the Johnson administration has gone to Congress to win support for a program under which universities would aid industry in translating research findings into useful products and processes. Secretary John T. Connor told the House Commerce Committee:

> "Our scientific and technical know-how, which is constantly expanding, and improving, should be communicated to, and made available to, business firms throughout the nation. This must be done if the American economy is to realize its full potential from science and technology."

The timing for organized complementary efforts by industry, government, and library networks at the local level might thus be just right. And the timing for a spectacular move by New York State might be just as right.

RESPONSE:

DR. WILLIAM S. DIX

Librarian, Princeton University Libraries

I HAVE FOUND Mr. Mesthene's formulation a very interesting and stimulating one. I have also found his elaboration of it highly rigorous, and I had some difficulty with it. I have taken the liberty of paraphrasing, in oversimplified layman's language, his central point.

In defining one of the "old problems and new demands" with which this panel is concerned, he addresses himself to the problem of "information transfer," particularly the "efficient transfer of our technical knowledge for use." He suggests that our resources devoted to scientific communication are concentrated too exclusively on making information *available,* too little on *transferring* technical knowledge to nontechnical users.

Now my own difficulty comes, perhaps, from a misunderstanding of his premises or my unfamiliarity with the context in which he is speaking. Let me try to explain my predicament by a library parallel, again much oversimplified.

The public library movement in this country has been concerned for a long time with both aspects of the problem. As managers of one kind of trading-post in the long caravan route by which intellectual goods are moved from their originator or manufacturer to the individual consumer, librarians have first spent considerable energy in building up the stock of the trading-post. They have decided what stock is most useful and appropriate for their own communities, or at least what is in demand. They have gone back to the next stages in the caravan route, the publishers and book distributors; have obtained from them this intellectual merchandise, packaged in the form of books and journals, and have stocked their shelves with it. They have to some extent played their part in making it *available.*

Librarians have also done more, at least since the founding of the American Library Association in 1876, and I suspect since Amel-anu set up his shop in Babylon in the second millenium before Christ as the first librarian whose name we know. Most of them have not at this point wrapped themselves in their robes and said, "The stuff is on the shelves; let the Bedouin come and get it." Filled with zeal and the certainty that their wares are priceless and essential to mankind, they have made catalogs, they have formed leagues with other trading-posts, they have busied themselves in all sorts of ways to make the goods on the shelves as absolutely, completely available as possible.

They have done more. They have posted signs at the crossroads saying, "To the Library"; they have cast bait at the waterholes; they have stretched out their skinny hands to hold any wedding-guest who might be persuaded to tarry and listen to the tale of their wondrous wares. They have, in other words, been vitally concerned with the *transfer* of knowledge as well as its *availability.*

Now, this final stage, I take it, is what concerns Mr. Mesthene. He thinks that we have not devoted enough attention to the transfer part of the process and that our society should spend more time and money on improving it. He is probably right, and I am with him.

There is certainly need for continued research on mechanized cataloging, indexing and abstracting services, and the utilization of computer technology to improve the whole process of the storage, retrieval, and dissemination of information. But the nature of the research which would demand a comparable expenditure of time and money on the transfer process is not quite so clear to me.

My trouble with his premises comes, I think, from what I take to be his assumption that the transfer of knowledge, as opposed to its availability, is somehow uniformly essential to society. I think that I agree with respect to the general areas which he specifically, for today, excludes from his consideration: that is the transfer of information and ideas from scientist to scientist and the transfer of knowledge in the broadest sense in the humanistic fields to our society as a whole. I would include among these humanistic fields, of course, the history and philosophy of science, the attempt to explain to the rest of us what the scientist is about, and the relevance of science to human affairs. But Mr. Mesthene has today limited his discussion rather specifically to the transfer of scientific information to nonscientific users for practical purposes, and it is precisely here that my own trouble begins.

Let me go back to the library parallel in an attempt to explain this point of uneasiness, and this is only a parable, of course. Librarians, as I have said, believing that literature, art, history, music, philosophy, are good for society, have been concerned with *transfer* in these and similar areas and have not only attempted to make books fully available but tried to seduce people into reading them. They have not, I believe, had quite the same attitude toward technical information, presumably because they have not thought it necessary. For example, I am told that if a patron asks, a librarian at the reference desk of The New York Public Library will tell him how to remove spots from his necktie. But the NYPL, while it may advertise the availability of this service, does not, I think, undertake to inform the whole populace of New York about sanitary dry-cleaning methods. It assumes that the messy eater will find his way to it, but it is more concerned that the citizen know something about the United Nations and the Greek ideal of the golden mean. Let me assure you that I have some vague sense of the difference between the transfer from the scientist to the technical entrepreneur and transfer to the man with egg on his tie. The point I am trying to make is simply that we may perhaps assume that the desire and the need to know will lead the manufacturer and the other consumers of technical information to the right source if availability is assured, while it is in these other areas that transfer is as important as availability.

It may be argued that technological innovation is just as important to the health of our society as general education. Even a living, great philosopher would agree that in some areas, such as the development of new sources of energy, it is as important, but he might feel that in these areas information transfer may safely be left to take care of itself if enough information is generated and made as accessible as possible. He might also feel that a society whose economic health depends upon the constant and unending introduction of new gadgets, such as ever more powerful and more quickly obsolete automobiles, which we have space for neither alive nor dead, is already on the primrose path to self-destruction.

Somewhat less sanguine than Mr. Mesthene about the vulnerability of a problem of this sort to formalized research, I would make only one or two general observations.

1. First, the essential element in the solution to any intellectual problem is education. The formal higher education system of this country is reaching a larger percentage of our citizens than any such system ever has before in the history of the world. We must obviously keep trying to improve its quality as well as its quantity. Since the people involved in this transfer of information from scientists to nonscientists have been exposed to this system, it is to formal education that I would look to prepare the way on both sides of the equation for successful transfer. This is now going on in many colleges as a part of undergraduate education. At Princeton, for example, the president appointed several years ago a faculty committee to conduct a "Program on Science in Human Affairs," to wrestle with the problem on various levels, and the result has been encouraging. Several experimental courses on science for the nonscientist have been offered, not superficial surveys, but solid, substantive courses designed to give those students who will be decision-makers in business, industry, government, and education a better understanding of the real nature of science and its processes as a part of their general cultural background. A continuing series of faculty seminars and discussions has created a general awareness of the problem. Prof. Isidore Rabi, the Nobel Prize physicist from Columbia, came down for a year, not as a member of the physics department but as a visiting professor of history, to lead some of these discussions and to teach undergraduate courses.

I am saying simply that we should obviously take advantage of our formal educational system, and I believe that we shall see more of this sort of activity on many campuses.

The university library, of course, has an important role. At Princeton, for example, we have set up a special reading room, not in one of the science libraries, but in the Firestone Library, which is primarily a humanities and social science library. In this room we have built up a carefully selected collection of books on science at an essentially nontechnical level, which is attracting a substantial amount of independent browsing as well as supporting the new science courses for nonscientists.

2. But all of this is at the general level. In attacking the special problem of concern to Mr. Mesthene, the transfer of science to nonscientists *for useful purposes,* the formal educational system seems to me once again the place to begin. I would almost say that if we produced enough good engineers, the problem would disappear. For the role of the engineer in society is surely precisely this transfer from theory to use. The modern engineer, no longer a handbook mechanic but an imaginative applied scientist, is the bridge, and he is being taught in this manner. Again, at my own institution, for example, where significantly a few years ago the name of the School of Engineering was officially changed to School of Engineering and Applied Science, there is a course devoted particularly to requiring students to examine a variety of relatively new developments, such as lasers, and then seek new applications for them, as an exercise in technological innovation.

On the library side, here's where I think we've failed. We have not yet found ways of doing enough. The engineer, in particular, because of his special role in information transfer, should learn in college all there is to know about getting knowledge from available sources. We have all experimented with courses in engineering literature or something of the sort, but we have not yet found the best ways of imbedding them in the regular required engineering curriculum. What is required, I suggest, is not to offer a few hours on how to use the library as a student, but to graduate engineers fully trained, as a part of their technical qualifications, in all the techniques of extracting the ideas and information they need from the jungle of available sources. Here is where we might profitably help redress the balance and spend some of the energy and money to which Dr. Mesthene refers.

3. Outside the academic world, there is undoubtedly plenty of room for improvement in accessibility, especially for those engaged in industrial research and development. But I still think that the user will have to take the initiative to seek out what he needs. The nonscientific business entrepreneur who thinks that he can sit in his office and reap the harvest of scientific and technological innovation by waiting for new knowledge to flow in automatically is probably not bright enough to be in that office. If instead he hires an imaginative

and well-educated engineer to tap the available sources of pure and applied science, I suspect that the back of his problem will be broken, provided the knowledge is available.

In making it available I see no substitute for the library, a collection of existing knowledge in whatever form it is recorded, and provided with whatever tools can be developed for finding it. But this, I take it, is on the side of availabiility—not transfer. Specialized information centers are a natural extension of the library role and may help. I must confess to a certain doubt about them at the national level because I'm more and more convinced that it's the availability of sources immediately at hand that is the important thing here. Certainly, we need to do a great deal more to bring the swelling mass of scientific literature under full bibliographic control, to use an old-fashioned phrase.

4. Finally, I am unable to comment on Mr. Mesthene's proposals for research. I, myself would like to see experiment, as he has indicated also, rather than research. I simply can't comment on the problems of research in information transfer itself because I just don't visualize just what this research would consist of.

Now, these few comments on Mr. Mesthene's paper have probably provided an apt illustration of just what he was talking about—the need for better information transfer.

Science, Industry and Libraries

DR. CLIFFORD C. FURNAS

President, State University of New York at Buffalo

PART I—WHERE ARE WE?

WE ARE HERE TODAY TO DISCUSS the problems of storage of information, retrieval of information, and communication or transmission of information. The problems themselves are as old as the written word; but magnitude, environment and available tools have all changed very markedly. This had led to certain difficulties and dilemmas. I plan to set the stage by using five quotable vignettes.

A

> "It is a well-recognized fact that the process of science is seriously impeded by an over-abundance of scientific journals. Almost every scientific man finds that a deplorable amount of his time is given to the task of gathering together from scores of periodicals the *disjecta membra* of the literature in which he is especially interested, and, to make matters worse, there is always a certain residuum of such literature that escapes his vigilance on account of its out-of-the way place of publication. . . ."

That is a quotation from the *Scientific American* of the issue of May *1915*. During the intervening 50 years the implied futility and confusion has been multiplied by at least a hundredfold but, in some way, we have been able to survive, bibliographically speaking.

B

> "The data (from personal interviews with 1,375 persons) show that no recognizable need exists in the minds of Department of Defense users for new scientific and technical information systems."

further,

> ". . . . the field of oral communications occupies a much more important role than our emphasis on research in written communication would imply."

This from an address by Walter M. Carlson, director of technical information, Department of Defense, May 26, 1965.

From this, one would conclude that although research workers may be unduly provincial and myopic they are not nearly as worried about the information glut as their bosses. Further, conversation is and will remain one of the prime means of effective communication. It will always be very important to be able to walk down the hall and talk with Joe.

C

> "The growth of scientific papers doubles every ten years at the rate knowledge is being accumulated, libraries will be incapable of housing all of the books and periodicals reporting new developments."

From an address by Carrol L. Lang, published in the *Phi Delta Kappan*, May 1965. Presently available information would seem to bear out this prediction.

D

> "One of the most provocative aspects concerns the ultramicro reduction of recorded information. Pres-

ently available reduction techniques permit one to achieve reduction in area of 500 to 1. . . . A good optical microscope can reduce information by a factor of one million to one in area. . . . With such a reduction ratio, a large research library of five million volumes could be recorded in a space of five books . . . one might someday exploit the density of recording information at the molecular level and achieve reductions in area of 10 billion to 1. This would permit putting . . . all of the recorded knowledge in the world on two sheets of paper."

From an address by Don B. Swanson at Airlie Foundation, May 1963.

We may be in difficulty but it appears that there may be ways to get out of it.

E

"At the present time (this library) is not 'automated' and while space has been provided in a million dollar annex opened earlier this month, it is clear that the library is biding its time until the state of the art has advanced and the cost has come down."

That quotation is from *Science,* May 21, 1965. It refers to the Linda Hall Library at Kansas City, Missouri, which works closely with the University of Kansas City and the Midwest Research Institute, but also operates internationally. It is small. Its total number of volumes is 300,000 and it responds promptly to 30,000 requests per year. Using conventional methods, it performs extremely well with that volume of business, but it is obviously worrying constructively about what to do as demands increase beyond the current level. Perhaps that level of demand (approximately 100 requests per day) is a significant figure beyond which machine processing and other technological advantages begin to make sense.

PART II—WHERE DO WE GO FROM HERE?

Obviously we are faced with some weighty problems in connection with storage, retrieval and communication of information for the forward progress of the human race. Fortunately for our anticipated debut into the library function in the age of the full-fledged scientific revolution, there are several pilot projects already in the working stage which can provide very valuable guidance in facing the problem: Where do we go from here? I will present an outline of the progress on six of them.

A

Airline reservations. As compared to the good old days, something marvelous has happened. With the major airlines you may now go to the reservation desk and request a reservation or a change from your previous commitment, and the attractive young lady will usually say, "Just a moment, please." She pulls a code card out of a small file, inserts it into a black box, and pushes a few buttons. Things start clicking, mechanical fingers type out the answers, and she shortly hands you a piece of paper saying, "You have a reservation on Flight 783 leaving Wednesday morning at 9:23, change at Chicago to Flight 191 and you will arrive at San Francisco at 11:35 Pacific Daylight Time." This is all accomplished in a matter of decaseconds, or at the most within a few minutes—by a central computer.

You may well protest that this has nothing to do with libraries—that it is purely a commercial operation. It should only be necessary to point out, however, that your obtaining an assured airline reservation involves exactly the same parameters we are discussing: information storage (previous reservations and available flights); retrieval (what seats are already taken); transmission of information (your confirmed reservation). This example is greatly simplified because the storage and retention time of background information is only hours, instead of possibly centuries for libraries. This example is valuable, however, because it demonstrates that, given the necessary background data and the proper system organization, the system *will* work, reliably and rapidly.

B

Several weeks ago I had the privilege of visiting the library of the new Florida Atlantic University at Boca Raton, Florida. It is new—the first students were admitted in September 1964. It is small—about 50,000 volumes. The conventional card catalogs have been replaced by a series of volumes which resemble telephone books. Multiple copies are available so every professor may have a copy in his own office. The complete index is brought up to date once a month by a new edition produced by the computer. There is a daily read-out on the circulation record—volumes out with a designation of the recipient, along with the due-back date.

Unquestionably, the system is now working very well indeed. When I inquired as to how it will work when the collection increases to a million or a few million volumes and the usage by many-fold, the reply essentially was: we are not sure, but we are confident that equipment and systems will be developed in time for adequately handling any foreseeable volume and workload. It is to be hoped that that faith is well placed.

C

At the Roswell Park Memorial Institute for Cancer Research in Buffalo, operated by the State Department of Health, hundreds of subscribers start each day by looking through five to ten abstracts selected from the world's literature on cancer and surgery . . . and selected, mind you, for the specific interests and needs of the individual subscriber. These abstracts, prepared as each day's literature flows into the library, are on the subscriber's desk within 12 hours. They are printed on IBM cards, and the subscriber has only to punch the appropriate hole on a paired card, to have a full printout of the article in his hands the following day. Efficiently and effectively, the world's literature in this field becomes available in manageable form.

D

The Defense Documentation Center. The very difficult problems of ready availability and quick response to inquiry of the multitude of research and development reports and records of our Department of Defense are being handled by the Defense Documentation Center, physically located in Alexandria, Virginia, under the directorship of Walter M. Carlson.

This operation does not deal with the published literature; rather it confines itself to the progress reports, plans, and prospectuses of the research, development, test, and evaluation activities of the Department of Defense. The objective is to store and make available on a quick-response basis all of the pertinent information on all of the subjects, to the many thousands of persons who have a "need to know."

A few data from the operating report of February 1965, may give you a feeling for the operation:

The total collection is	770,000 items
Requests for documents—daily average	6,111
Requests for bibliographies—daily average	45
Working days processing time average	2.9
Organizations served	6,143

The operations are handled by a UNIVAC 1107 computing system.

The working personnel number 510.

The operating budget is about $20 million per year.

The clientele served are engaged in research, development, test, and evaluation for the Department of Defense to the extent of about $11 billion per year.

Recently this Defense Documentation Center has delved into the very tricky field of translation of foreign documents with emphasis on the Russian scientific literature. Many thousands of pages of the Russian scientific literature have been so translated. Cost comparison studies have been conducted with the following results:

Human translators—contract $32.94 per 1,000 Russian words

Machine translation (with human recomposition)—$36.18 per 1,000

Human translation, In-House, Dept. of Defense—$40.09 per 1,000

These data are significant only in that they show that machine translations of scientific material are presently comparable in cost to human translations and might well be expected to become much less expensive in the future, if applied on a large scale.

E

The National Library of Medicine (Bethesda, Maryland) publishes *Index Medicus,* a gigantic monthly bibliography of medical periodical literature. The effectiveness of its dispensation of knowledge was greatly strengthened with the activation in December 1963 of the computer-based *Med*ical *L*iterature *A*nalysis and *R*etrieval *S*ystem (MEDLARS). It has the capacity for handling 37,500 individual inquiries for bibliographic search each year.

F

In order to facilitate the development of a nation-wide communications network geared to academic needs, a number of universities have come together to form a "Brookhaven without walls." This organization, the Inter-university Communications Council (INTERCOM) was formalized in October 1964, by a number of major universities. These universities, currently including Harvard, Rochester, State University of New York, Virginia, Duke, Michigan, Pittsburgh, Illinois, and the University of California, have received a major grant from the Kellogg Foundation, and are presently conducting feasibility studies aimed at establishing a network of library communications.

Each of these universities has an institutional representative on the governing board. For State University of New York this person is Dr. Peter Regan of State University at Buffalo. This organization will operate on a nation-wide basis.

Similarly, within the 58 units of State University of New York, a parallel organization, the Intra-university Communications Committee (INTRACOM) has been organized and will operate within the national framework of INTERCOM. With representatives from university centers, community colleges, and junior colleges, it is initiating action by task forces in specific areas (medical libraries, bibliographic exchanges, etc.).

Where do we go from here? Consider a student in 1975, *provided* the equipment and systems presently available are put to full use. This student, any one of millions throughout the nation, will be able to use his unit library, or simply go to a fully-equipped library carrel located down the hall in his dormitory. Once in the carrel, he seats himself at a keyboard, and types out the kind of information he needs. The information is transmitted to a logic-type computer located on his campus, which rephrases his question, checks it with him, and connects him with one of four or five regional library centers, scattered throughout the State. Within seconds, the regional center gives him the total or fractional bibliography.

The bibliography is flashed on a cathode ray screen in front of him, he notes the articles which are of interest, and feeds back this information through his keyboard. Moments later, abstracts of the articles he has selected appear on the cathode ray screen. Having reviewed the abstracts, he selects the articles which he wishes to read in detail, and those are photo-reproduced by an instrument at the side of the cathode ray screen. Within a matter of minutes, he has been able to sample the world's literature, determine what is most meaningful to him, and get the full printed material necessary for him to satisfy his scholarly needs.

The application of these developments, as they grow, can be staggering. Clearly, as a library network develops within universities it can yield immense benefits to community libraries, to industry, health departments, community hospitals, and the myriad other segments of our society that are seeking a way of tapping the scientific knowledge of the 20th Century.

PART III—HOW DO WE GET THERE?

In order to move on in this exciting field, three items are necessary.

1. The clear and apparent need. (In the field of science and industry, that is self-evident.)

2. The equipment and systems required to carry out the work. Thanks to the vital computer industry those items are either available now or very close at hand. The generally accepted guidelines for the installation and operation of appropriate systems are available in the volume *Automation and the Library of Congress,* a survey sponsored by the Council of Library Resources, Inc., 1963.

3. Financial support. The support of the six pilot operations I have mentioned above has come from various sources, namely:

a. Airline reservations—private industry
b. Florida Atlantic University—State
c. Roswell Park—State and Federal
d. Defense Documentation Center—Federal
e. MEDLARS—Federal
f. INTERCOM—universities and private foundations

At the risk of seeming a wee bit provincial, I will suggest that the best way to get an existing pilot project to grow into a full-blown operation of great value and significance would be for the State of New York to provide substantial financial support to Project INTERCOM. As indicated above, the State University of New York segment of this national study is Project INTRACOM.

This financial support should be under the aegis, first, of State University of New York, and then Departments of Education, Commerce, Health, and other State Departments in need of the services. Other public and private universities throughout the nation would certainly have the opportunity to participate. The recommendations for implementing regional automated library systems is in hand in the report, *Strengthening and Coordinating Reference and Research Library Resources in New York State,* prepared by the New York State Education Department, 1963.

As soon as an automated system is in operation, even though only partially completed, its services can be made available to industry locally and nationally on a fee-for-service basis.

Widespread use by industry would eventually help very substantially in defraying costs.

In my opinion, the time for public support of INTERCOM is ripe and the time is now.

RESPONSE:

DR. DON R. SWANSON
Dean, Graduate Library School
University of Chicago

DR. FURNAS MAY HAVE correctly introduced a suspicion in your minds that the information explosion is neither a product of recent times nor of New York State. Let me confirm this suspicion by another quotation. "One of the diseases of this age is the multiplicity of books. They doth so overchange the world that it is not able to digest the abundance of idle matter that is every day hatched and brought forth." That was said by Barnaby Rich in the year 1613—so we are told by Derek Price, in any case. Thus, we have lived with the information explosion over a period of centuries and in some manner coped with it.

Dr. Furnas quoted some remarks that I once made concerning the ultramicro reduction of information. That story has an interesting sequel. On a subsequent occasion, I was trying to stagger the imagination of a few eight or nine-year-old friends of mine with the thought that some day they may be able to hold the world's supply of recorded knowledge in the palms of their hands. One little boy asked, "What do you suggest we do with it?"

Now I think that youngster exhibited a propensity for getting at the heart of the matter with a question that certainly I couldn't answer at that point, and which more often ought to be asked in the context of our considerations today of automation and its ability to cope with library problems. I suspect that it is the same youngster that I read about a few months later who had won a large contest, the sort in which you complete an entry in 25 words or less. His entry was "I use Ivory soap because I'm dirty."

The two examples, I think, have in common the perceptiveness of a childlike simplicity which could stand us in good stead in shifting the emphasis from technology itself to the purposes which it must serve. The following rather strong assertion is intended to assist further this shift in emphasis: *In the context of libraries, the computer application has yet to be conceived, the end purpose or result of which could not also be accomplished by more conventional procedures.*

Now it might seem as though this could be interpreted as a statement in opposition to the notion of mechanizing library processes. Yet, my intention is just the contrary.

There is a tendency in much of the literature, I think, (even that in connection with this conference and in some of the discussions of the conference) to shift one's attention from the problem itself to the assumption that automation will solve it, whatever it is. By emphasizing the nature of the cure before even diagnosing the disease, we stand to accomplish two things: 1. We develop an exaggerated impression of the capabilities of automation and, 2. We might make automation vulnerable to criticism for the wrong reasons, that it is economically unfeasible when wrongly used, for example.

In the last analysis, the only justification for any program of mechanization is one of economics, and I think it is useful in all cases to step from the phase of formulating a requirement or an aim or a goal, to some attempt to formulate an approach to meeting that *same* requirement by familiar and conventional techniques. Let's apply this notion now to some of the very perceptive and imaginative observations on goals and requirements that Dr. Furnas has brought out.

He describes an ideal situation in which the student of 1975 can interrogate a library remotely and with very rapid response. The bibliographic tools to which this student has access are complete in coverage and, in effect, represent the nation's total resources of information. The implication that we must have at our disposal a console of some kind connected to a machine with a huge memory is quite clear. It might also be effectively challenged as extravagant in cost. Yet, if we take it as an imaginative statement of a goal or desideratum, we then can see a number of alternative routes to reaching that goal.

The requirement for remote, rapid-response interrogation of a system can be met in a number of ways. For example, the console, instead of costing $30,000 with an elaborate keyboard and cathode ray tube, might, for a certain class of questions, be represented by a very simple or inexpensive keyboard. It might even be a book (or microform!) catalog published centrally and distributed widely.

This latter idea is, of course, not new but I think it is of especial importance to consider in the light of remote interrogation of library catalogs. The ability to print catalogs in many copies and distribute them widely meets a *part* of the requirement that was stated. Possibly a telephone connected to someone who does have a machine and console, and who does have the tools of interrogation of a more sophisticated nature, could extend the capability still further.

Other requirements or desirable goals that were pinpointed by Dr. Furnas, I should like briefly to single out as matters for further consideration. Selective dissemination, in the third example that he gave—that is, the highly specific dissemination of information directly to the user—suggests need for an active role in library systems on which I would like to comment further in a few moments. Finally, he also brought out a very important requirement: informal and verbal communication.

The essential point that I should like to emphasize here is the need to state goals or requirements independently of the particular means of implementing them. Once these are stated, it is the job of a system's design or planning engineer to formulate a number of alternatives for reaching those goals, and then to consider which of these alternatives are economically the most feasible and the most viable. In this connection, I think the plan of New York State still stands in need of a system study. The requirements have been recognized. Alternative means of their fulfillment and an economic analysis of these means is still to be done;

the study itself will sharpen requirements and expose questions that have as yet been unasked. It will be discovered in a course of such design that it will, as Mr. Lacy suggested earlier, take money to improve matters, whether this money is invested in more books, and other resources of a conventional nature, or whether in automation.

Now, lest I be accused here of dealing solely in vague generalities, let me turn to a few vague specifics. I suggest that the aforementioned systems analysis be centered initially (but not exclusively) on a cost performance study in the central production and wide distribution of printed or microform catalogs and a variety of bibliographic by-products that could be printed at the same time. Whether these printed catalogs are produced by machine or by other procedures is a matter again for economic comparison and is not crucial to the issue itself. It is crucial to determine, for example, what proportion of library interrogations could be satisfied by consulting a book catalog in contrast to the more sophisticated dialogue that could take place at a relatively expensive machine connection to a computer system.

The second specific recommendation is prompted in part by Dr. Furnas' quotation number 2 (of Carlson) which implies that there is serious doubt in the minds of many users as to whether new and improved information services are really needed. I have a particular interest in that statement. I have often heard, and I think that evidence will bear out, that even the best of information systems run serious risk of not being used. Because as wonderful as a system may seem to its designers, it can fail if it doesn't adequately take into account what its users wanted and it doesn't properly assess their motives for using the system. It is probably more sensible and sounder to assume that users of information systems are afflicted with a sort of galloping apathy toward information services and that one must market information products in all conceivable ways to make the system convenient to use, to bring it to the point where the user is, and to make it rapidly responsive.

I am particularly appreciative of the conjecture that the users of information systems really might not want such information systems; and, therefore, the designer should take this into account. But the act of taking it into account, I think, has a beneficial effect, whether the assumption is right or wrong. Certainly it is better to design a system on the assumption that it won't be used, since then one takes all conceivable measures to make it attractive. Now, one of the most important of these measures and one which is also rather expensive, is selective dissemination of some kind, in which the system takes an active role in bringing information directly to the one using it. This deserves a good deal of serious study in all types of libraries. In the sciences and in industry I think it clearly fills a vital need. It is furthermore an area wherein microform technology may be of particular significance. The ability to reproduce many copies of journals at low cost might make it possible for each scientist to subscribe to a hundred or more journals. The selective dissemination process could then operate quite separately, and serve the purpose of telling him which articles to read.

BANQUET

Presiding: **THE HONORABLE MALCOLM WILSON**
Lieutenant Governor, State of New York

"Libraries: Cooperation or Chaos"

DR. BURTON W. ADKINSON
Head of the Office of Science Information Service
National Science Foundation

Libraries: Cooperation or Chaos

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THE STATE OF NEW YORK deserves congratulations for having library officials with courage to face the urgent library problems of today and the foresight to seek programs to meet them; and for having a State administration that recognizes library activities as an important part and element of a state's educational, social, economic, and technical advancement so as to need attention at the highest levels.

I. *Introduction*

As we look at library development, we must keep in mind that libraries must continue to provide the services they have furnished in the past, yet at the same time they must respond to such changing conditions as:

The explosive increase in the amount and the rapidly changing character of the world output of literature.

The almost frightening pace of technical advances that affect not only library techniques but the very character of the communities which libraries serve.

The increase in and the swiftly shifting character of readers' needs.

Because of historical inertia and large investments in collections and bibliographic apparatus, library planning has tended toward simply allowing for still bigger collections and serving more users in conventional ways. In the face of these new challenges, however, such planning is wholly inadequate. Planning must shift toward systems of interdependent libraries that share the growing load of literature and services, taking advantage of technological innovations that can both increase the effectiveness of the libraries in the system and also improve ease and speed of intercommunication among them. It must also take account of the sharp changes in operations and in manpower that will be needed.

There is no doubt that these changes will cost money. There is promise, however, that if they are planned effectively, we will not only avert an otherwise intolerable overload situation but emerge with a system that yields services of enormously increased benefit to our culture and economy. It is the nature of the required effective planning that I shall discuss here.

II. *Considerations Influencing Library Development*

A. *Interdependence*

It is becoming increasingly clear that no library, no matter how large, can be self-sufficient to the point where it can maintain collections and services adequate to meet all the demands made upon it. Therefore, there must be a more orderly, planned development of cooperation. For example, as many have pointed out previously, some functions such as cataloging, maintenance of an effective union list of serials, and acquisition of materials from areas with no organized book trade may best be done at the national level, freeing regional, state, or local effort for other application.

On the other hand, state and local library collections and services must become more specialized and selective in their response to users. This they may do if they are in a position to draw upon the services developed at the national level.

The interdependence should be not only vertical but horizontal; that is, each library must be able to place reliance on other national, state, or local library services and collections for performing special tasks outside its own planned zone of operations.

In addition, it must be recognized that many bibliographic and other library tools so essential to library services, such as abstracts, indexes, handbooks, manuals, and data compilations, are prepared outside the library community. In the past, librarians have been prone to accept these tools in a passive manner and have neglected to make known inadequacies revealed in trying to provide service to library users.

One sees in this vertical and horizontal interdependence not just the obvious need for cooperative division of effort but an equally vital requirement for information-feedback loops. Very often the conditions that this interdependence requires are overlooked.

B. *Meeting User Needs*

We sometimes forget that the only purpose for libraries and library systems is to put the material on the desk of the person, in the right amount, and in the time that he needs it.

To get the most out of library manpower and funds, still another sort of interdependence is required. This rests on the recognition of a variety of reader groups, and the allocation of primary service responsibilities among libraries so each can serve its own group, together with articulation among them to provide for requests that cross boundaries. This in turn demands:

1. Relaxation of administrative and legal restrictions that have often hampered the articulation. Thus public, school, college, and university, as well as specialized, libraries should be able to supplement one another's resources freely, without stumbling into rules and regulations that forbid some kinds or routes of interchange. For example, why should a community with limited library resources maintain inadequate and distinct public and school libraries? How does one get the benefit of valuable, private library resources without undue financial and other burdens on those institutions?

2. Active effort by each library to make its services known. Too often, a reader fails to approach a passively awaiting library effectively because he lacks knowledge of the character of its collections and the kinds of services it is able to provide.

3. Clear identification of the needs of users of each library or library system so that the nature of the collections and services appropriate to each may be determined.

4. Finally, the development of the standardizations needed for such interchanges as this interdependence will certainly require.

C. *Manpower*

As one can deduce from the foregoing statements, manpower requirements will change markedly as new developments unfold. There will be a need for new types of professional and technical manpower within the library structure. Planning, particularly at as high a level as a state, must recognize that

1. The profiling of individual library collections and services and the development of adequate interconnections will increasingly require highly trained professionals.

2. The introduction of technical innovations will in itself require a change in manpower requirements. One only has to mention the problems which faced libraries with the introduction of microfilm and microfacsimile services to illustrate the kind of manpower change that such innovations may demand. In this particular category of change, there will be the need for a clearer distinction between professional and technical manpower needs than has sufficed in the past.

3. Finally, in shifting away from traditional planning based simply on collection growth and increased reader load, planning that takes into account the changing character of readers' demands and character of the materials available to meet those demands must be substituted. As an example, it will not be long until libraries may face a situation where materials are sent to them on paper or electronic tape, or punchcards; and they will have to be ready with the technical manpower as well as the equipment necessary to use information provided in these forms.

D. *Technology*

Here I would like to begin with the commonplace observation that computers and related hardware advances are beginning to have, and will have in the future, a marked impact on libraries; and also that they still guarantee no panacea. One must remember that technology should be introduced into a system after careful consideration of its contribution to the economics and effectiveness of that system. Some of the immediate contributions that machines promise are:

1. Ability to produce, or manipulate easily, library catalogs.

2. Maintenance of current serial records—something that the library profession has never been able to do. Every serial record or union list of serials has been a historical document when it saw the light of day.

3. Production of general and specialized indexes.

All of these have routine, repetitive aspects that are amenable to automation in its present state of development. Contributions in the not too distant future are:

1. The ability for library personnel, as well as readers, to conduct dialogues with the library's bibliographic apparatus through remote consoles, or specially printed catalogs.

2. Routine weeding of collections through data provided by mechanized inventory and usage records. I might say here that my experience in the Library of Congress of this latter item was an interesting one. We decided that there were too many things on the shelves at the library—we were crowded and we ought to take the material off. We proceeded to do so—several tens of thousands of volumes, and they sat on the floor for several weeks and were then put back on the shelf. It was too hard to change the records in the Library of Congress. A manipulatable record in machine form could make that rather an easy system.

E. As a final remark on the planning of library systems, I would like to return to the observation made earlier regarding the need for maintaining continuity of operations while adapting to changes. In my view, planning should look to evolution, not to revolution. Libraries serve individuals who will need to be trained in the use of new capabilities and procedures before they can be served by them. Thus, too big a jump toward automation of services may end up in calamity, by the lack of use of the readers.

The evolution toward improved services based on mutual interdependence again underscores the need for cooperation. Libraries that perform national services and extend them to state and local libraries must move rapidly toward identifying the direction of their intended changes and the type of innovations that they plan in order that state and local library groups can plan to adjust to these new changes.

This emphasizes the fact that library planning, in addition to making sure that we are moving in the same direction, must assure that we are moving at the same rate. If the various library systems are out of phase in development, we can reach a chaos of incompatibility as surely as if we all move in different directions. Premature introduction of technical innovation at the local or state level, for instance, may cause dislocations which will require drastic retooling when national services become available. I do not mean here, however, that this relieves the states or localities from planning effective, flexible systems, so that they can take advantage of national or other resources as they become available.

III. *A Look To The Future*

So far, the emphasis of these remarks has been on the necessity for planning for innovation and improvement in the library system of this country. A look toward the future may be helpful. A national complex of library systems might have these characteristics:

A. National libraries that take responsiblity at the broadest level for:

1. Producing comprehensive catalogs available on a current basis in a form that is useful to state and local systems. A firm requirement here is a technique and system that allows national libraries to furnish catalogs that can be manipulated with computers, yet at the same time handled manually, since cost and other considerations will compel most local libraries to operate on a manual basis for many years to come.

2. Developing national union lists of serials, with identification of selected holdings. These lists must be in a form that can be easily manipulated so that they can be a basis for state or other specialized lists set up by libraries to match their own particular needs.

3. Clearly defining the individual national libraries' subject areas of responsibility, and assuming responsibility for the acquisition of and service on all materials in each area so identified.

4. Finally, developing and maintaining, on a current basis, indexes of the items in the national library collections.

B. State or regional library systems which draw on the national tools and develop services and tools of their own to provide:

1. state or regional catalogs;
2. state or regional union lists of serials;
3. acquisitions programs that match service needs without duplicating national collections in subject areas of little regional or state interests; and
4. automatic data processing, computer, facsimile transmission facilities when these are identified as useful components of the system.

C. Local library systems such as school, public, college, or university should develop their systems so that they:

1. Draw on the regional as well as the national library systems and services and collections, and yet at the same time have adequate working collections to meet their own high-frequency-of-demand needs.
2. Have switching mechanisms to connect themselves vertically to regional or national services and collections and horizontally to libraries having special services within their region. All of this as you see, will take a tremendous amount of planning—technically, administratively, and professionally.

The cooperation both in planning and operation that the foregoing entails is obvious. Standardization, yet at the same time maintenance of flexibility at all levels; feedback loops, horizontal *and* vertical, that assure responsive planning for new or changing needs; staffs better trained and differently oriented—all will be involved.

One aspect of planning has so far been neglected: namely, that of costs. (Here I address myself to the officials of New York State, not to the assembled librarians, to whom I think I may safely assume the question of costs has already occurred.)

Library services in the United States have for the most part operated on substandard budgets. Librarians have used great ingenuity to continue to maintain services in the light of slowly expanding budgets but rapidly increasing collections and reader loads. Now, if they are to meet the additional challenges introduced by changing characteristics of information tools and changes in reader requirements, and to realize the potentials of cooperative systems and innovations, increased support for libraries, rather than search for marginal economies, is inevitable.

The important consideration in planning at the State level is to assure that there is a realistic cost-benefit ratio developed. To illustrate, it would be an exercise in futility for states and other supporting groups to increase their library budgets if the libraries were only to increase their acquisitions of materials and continue to provide services on a loosely linked, haphazardly planned basis that promised no commensurate increase in user benefits.

In short, planning such as this State has initiated must be expanded and refined, but it should have two dimensions. There is real need for division of labor in acquisitions and services to assure maintenance and upgrading of present services; but plans should also assure increased variety, improved quality, and increased speed of services so that the higher cost of the entire operation yields maximum benefit.

New York State has already taken a commanding lead in identifying, analyzing, and even experimenting with working solutions to many aspects of today's library crisis. I am glad to see the Governor of this State inciting the community of libraries and librarians of his State to still more intensive effort. The undertaking is remarkably complex, but the promise it offers should excite the best energies available to this community. I am sure we will all rise to the occasion.

Friday, June 25

Panel II

NEW DIMENSIONS FOR REFERENCE AND RESEARCH

Automation and Data Processing
National and State Organization for Library Services
Regional and Local Organization for Library Services

Chairman: **FRANCIS R. ST. JOHN**
President, Library Consultants, Inc.

Automation and Data Processing for Libraries

VERNER W. CLAPP
President, Council on Library Resources, Inc.

NO ONE WHO HAS ever had the good fortune to rub shoulders with the collections of a great—or even a good—library has failed to be impressed with the enormous quantities of valuable information which are available there but which are simply not being used because of the obstacles which separate the information from its potential users.

Although the whole activity of libraries is devoted to acquiring and organizing publications so as to make their contents accessible, yet, in general, a series of favorable circumstances must occur before the circuit is closed and the information can flow.

Let me give you an example from my own recent experience. When the Council on Library Resources was established in 1956, one of its ambitions was to be able to improve the permanence and durability of book paper. Our first step was to ascertain, through a research project conducted under the auspices of the Virginia State Library by W. J. Barrow, the well-known manuscripts-restorer and inventor of the Barrow process of document-lamination, just what has happened to book paper in the first half of this century. By testing some 40,000 separate strips of paper cut from old books, Mr. Barrow found out. He later put this knowledge to work in developing a permanent/durable book paper, competitive, price-wise, with conventional commercial book papers; but he has also, with the Council's support and as time permits, been pushing his inquiry back into the 19th century, the century which witnessed the transition, approximately 1865-1890, from rag to chemical wood pulp as a principal source of paper. Somewhat to his amazement, Mr. Barrow is finding that the all-rag paper of the 19th century, which we have all this time been nostalgically regarding with so much respect, was little if any better than the chemical wood pulp paper which displaced it—and for exactly the same reasons.

And now, just the other day, my colleague, Lee E. Grove, came across a strident little book* by a Scottish scientific writer and lecturer named John Murray published in 1829 in which the author describes the debased paper of his day—and the causes of the debasement—in terms substantially identical (though more impassioned) with those used by Mr. Barrow 130 years later.

In other words, at the moment in 1957 when Mr. Barrow was starting his inquiry, the essence of the information which he was setting out to seek (though not, of course, the meticulous demonstration of its truth) had been in the record for more than 125 years. Murray had plainly identified the principal culprits of debased paper as bleaching agents and papermakers' alum. Yet 135 years later this information had not come to the attention of some to whom it was not only personally and professionally interesting but also officially important as affecting the care of valuable collections of public ownership or interest which may be in their custody. Why was this?

This is no idle question. If we can identify the obstacles which prevent useful information from being used, perhaps we can find the ways for obviating them. Unfortunately, as in so many of the matters that affect information services, it is rarely possible to prove that this or that circumstance prevented the utilization of a particular piece of information. As in medicine, we are dependent upon hypothetical diagnoses; and the validity of our diagnosis will be tested, as in medicine, by the efficacy of the therapeutic which we prescribe.

My diagnosis of the reasons for the failure of John Murray's 1829 invective to affect the course of papermaking and manuscript restoration would include the following:

First. The physical availability of John Murray's book seems to have been low. Besides the British Museum Library, which has a copy, believed to have been acquired at the time of publication under the requirements of the Copyright Act, I have learned of only three other libraries in all of Britain that even now own copies—the library of Edinburgh University, the library of the Literary and Philosophical Society at Newcastle upon Tyne, and the Bristol Public Library.

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* John Murray (1786?-1851): *Practical Remarks on Modern Paper* (Edinburgh: W. Blackwood; London: T. Cadell, 1829), xii, 119 p. 20 cm.

In the United States only two copies are listed in the National Union Catalog—that of Princeton University, acquired about 1912, and that of the Library of Congress, acquired by purchase in 1921.[*]

The book apparently remained in print until at least 1846.[†] This would suggest a slow sale, if any.

Second. Low as the physical availability of the book may have been, its bibliographical availability—that is, the arrangements by which it might become known to someone seeking information on the subject-matter involved—seems to have been even lower. Although I do not know what subject treatment may have been meted to the book in other British libraries, it appears that the British Museum Library has not to this day cataloged it by subject. The subject catalog used by the British book trade in the first half of the 19th century was the London Catalogue. The 1831 volume, however, does not list the Murray book in the subject section, while the 1848 *Bibliotheca Londinensis* (which is the subject index to the 1846 *London Catalogue*) lists it under the heading "Trade and commerce," where it may be reasonably supposed that it was never found by anyone looking for information on the deterioration of paper.

The Princeton University Library's copy came bound with a number of other booklets in a volume labeled "Paper," and was cataloged under that entry. The Library of Congress subject-cataloged its copy promptly upon acquisition under the same heading, but by 1921 this was not a very distinctive designation.

Lastly, it may be mentioned that the book is not listed in the Kantrowitz bibliography of paper deterioration.[‡] While this bibliography (published in 1940) did not pretend to go back before 1885, yet it is probably accurate to say that nothing came to the attention of the authors to cause them to take a different beginning date.

In sum, except to someone who (like Lee Grove) was browsing with an historical interest through the literature of paper in one of the few libraries in the world which not only has a copy of this book but has also cataloged it under subject, it would have completely escaped notice.

Third. But something other than the mere difficulties of physical and bibliographical access would seem to be necessary to explain the complete loss of the message of this book for more than a century. Among the several factors that may be suspected, my guess is that the most important was the rise of the polluted-industrial-atmosphere theory of paper deterioration.

I intend at some time to investigate the progress of this theory which even in our own days has materially obstructed the solution of the deteriorating-book-paper problem. My guess is that it arose in the second quarter of the 19th century with the increasing density of the London smog and the murk over the Five Towns. Kimberly and Scribner of the National Bureau of Standards have stated (without citation) that the earliest known mention of deterioration by sulphur dioxide is in a lecture in April 1843, by Michael Faraday, who attributed the rapid decay of leather binding and upholstery in the Athenaeum Club in London to by-products from illuminating gas.[*]

In any case, by the turn of the century (May 1898) the theory was sanctified by the report of the special inquiry into the causes of paper deterioration conducted by a committee of the British Society of Arts. The committee, which had taken up evidence on a wide scale from librarians, archivists, paper-makers, and scientists, just missed rendering an epoch-making report which might have materially altered the course of history. The committee had information in its possession which pointed to the correct explanation of the situation, but it was so hypnotized by the polluted-atmosphere theory that it passed the evidence by without realizing its significance. In any case, it believed the fear of deterioration to be exaggerated.[†]

By 1934, there were many who knew better, but in that year the National Bureau of Standards, still under the spell, reported that "it has been definitely established that sulphur dioxide is one of the principal factors governing the deterioration of paper."[‡] And as late as 1945 a principal manual on the care of books warned that "the air we breathe may be one of the worst enemies of the books we collect."[§]

A corollary of the polluted-industrial-atmosphere theory was the "all-rag-paper" doctrine of permanence.

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[*] It is listed in the *London Catalogue of Books* (in print) for 1810-1831 (London: R. Bent, 1831) and also for 1810-1846 (London: T. Hodgson, 1846).

[†] I have since learned that The New York Public Library also has a copy of the book, fully cataloged under the headings "Paper," "Paper—Preservation," and "Manuscripts—Restoration."

[‡] M. S. Kantrowitz, and others: *Permanence and Durability of Paper. An Annotated Bibliography* (Washington: United States Government Printing Office, 1940), 114 p. 23 cm.

[*] A. E. Kimberly and B. W. Scribner: *Summary Report of Bureau of Standards Research on the Preservation of Records* (Washington: United States Government Printing Office, 1934), p. 6.

[†] Report of the Committee on the Deterioration of Paper. *Journal of the Society of Arts* (London) 46: 597-601, May 20, 1898; 46:698-699, July 1, 1898.

[‡] Kimberly and Scribner: *Op. cit.*, p. 11.

[§] H. M. Lydenberg and J. Archer: *The Care and Repair of Books* (3d ed. rev., New York: Bowker, 1945), p. 17.

Because the only paper that had survived from the past was all-rag (in practical terms there was no other to survive!), it now began to be said that if you wanted a paper to last it should be all-rag. The Library of Congress was once hoist on this petard when the important book for which it had in 1906 procured an all-rag paper from one of the most reputable paper-makers of America went to pieces in less than 25 years.* The fact was, of course, that the same processes of paper-making which led to the destruction of chemical wood paper also led to that of all-rag, as John Murray—if we had but read him—would have informed us. But the all-rag legend persisted. The larger libraries have, for example, always made a point of using catalog cards of all-rag stock; recently it has been found that some chemical wood stock was more permanent/durable than some all-rag.†

The great damage that the polluted-industrial-atmosphere theory did was this: it took the heat off the paper-maker and put it on the coal-and-illuminating-gas consumer. And since everyone, for most of that 125 years, burned coal and, for a good part of it, illuminating gas also (just as today everyone contributes to smog by driving a car), no one was anxious to promote a reform which would require a sacrifice from himself. Meanwhile, with attention successfully diverted from its real source, the trouble persisted in spite of John Murray.

So much for diagnosis. What remedies do we prescribe?

First, let me describe the library situation which the remedies are expected to bring about. This situation will have, among others, the following characteristics:

a. There will be an enormous improvement in the conditions of bibliographic access. By this I mean that an inquirer asking about the publications available on a particular subject will be given an answer which will not need to be limited by the contents of the catalog of the responding library, but will reflect the contents of the libraries of a region, of a country, or—if need be—of the world. It will not be necessary for Lee Grove to go to the Library of Congress to find John Murray. He would be equally fortunate if he went to the Albany Public Library.

b. Because the capability just described might only too easily swamp the enquirer with more material than he can use, techniques will be developed for making a selection from the total so fashioned as best to serve his need.

c. Because of the lethargy of users of information (or their shyness or lack of facility in seeking potential sources of information), means will be developed for calling the attention of users to the existence of information of potential use to them. Methods will be similarly developed for stimulating their curiosity, their interest in improvement, etc.

Now it is obvious that if such improvements can be effected in the conditions of library work, magnificent new dimensions will be added to reference and research. It is equally obvious, however, that if such improvements are to be effected without enormous costs in staffs, catalogs, and collections, libraries will need the assistance of techniques which are not now available. Can we describe such techniques? I think that we can begin to do so.

For more than 10 years now, people who have been fascinated by the amazing speeds with which computers can execute certain mathematical and logical procedures have been asking librarians, "Why don't you put your catalog on a computer?" It has been a little hard, all these years, for librarians to explain to these enthusiasts just how a bibliographic task differs from a mathematical one, but in essence the reasons why computers have not comfortably accepted library catalogs resolve into the following: (a) it is expensive (costing approximately a dollar an entry) to enter a library catalog into machine-readable form; (b) until very recently the typical language of the computer was limited to 26 capital letters, 10 Arabic numerals, and a sprinkling of punctuation; whereas the typical library catalog requires a wide assortment of upper and lower case, Roman, Italic and non-Latin alphabets, punctuation, accents, diacritics, etc. (a computer can often manage with as few as 42 sorts of type, while to print a journal like *Chemical Abstracts* requires over 1,000); (c) the size of a computer's random-access memory, compared to that of a library catalog in book or card form (which can be opened at any point without sequential searching of the whole file, or even of a substantial portion of it such as might be represented by a roll of computer tape), is very small and expensive; and (d) to hold a computer subject to call (i.e., "on line"), as a book-form or card catalog is held, would be unjustifiably expensive, costing sometimes hundreds of dollars per hour, while until recently the contributions that computers have been able to make "off line," e.g., by printing out their results, as in the form of concordances, indexes, or lists, have been minor.

This situation is changing drastically. For some months now it has been possible for the computer to command typographical variety to the full capacity of the composing machines. Only when this stage was reached did it become useful to promote a standard for the conversion of bibliographic information into machine-readable form, and for employing this standard in the creation of a central source of supply for such information. Both of these developments have taken shape during the present calendar year. A meeting at the Library of Congress in January last gave general endorsement to a conversion procedure.* The second development is now similarly proceeding at the Library of Congress where it involves the conversion of some 65,000 catalog entries for the "California List of Books for a College Library" to machine-readable form. These 65,000 entries may be expected to be merely the first of a rapidly increasing corpus of generally available material in this form.

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* V. W. Clapp: "Permanent/Durable" Book Papers. *ALA [American Library Association] Bulletin* (Chicago) 57:827-852, October 1963.

† W. J. Barrow: *Permanence and Durability of Library Catalog Cards* (Chicago: Library Technology Project, American Library Association [c. 1961]), viii, 40p., 24 cm.

The significance of these developments is this. As soon as libraries are able to purchase bibliographic data in a standard machine-readable form, they will be in a position to manipulate this data on local data processing mechanisms without themselves bearing the cost of generating the machine-readable record. In consequence, it may be expected that the use of data processing mechanisms in library work will proceed rapidly—for printing catalog cards, catalogs in book form, accession lists, inventories, purchase orders, and subject bibliographies, for use in circulation systems, etc. Now, once such a situation exists, interinstitutional communication of bibliographic data in machine-readable form will be the natural next step. No longer will one take down a title from the National Union Catalog by manual transcription of a message received in audible form over the telephone; the information will be transmitted over the telephone line, indeed, but the electrical signal will not be converted to an audible signal for human transcription. It will go directly to the local library's data processing machines. At this point the local library will, in a sense, share the possession of the catalog of the central library because its access to that catalog will be as automatic as that of the real owner. At this point, too, it takes little stretch of the imagination to foresee that the research library of the future will be able to tell its customers what exists on the subject of their interest anywhere in the world. I said "research library"; but for this purpose every local library will be a research library.

We have been talking so far about library catalogs; these are typically restricted to books as contrasted with periodical articles. But I do not mean to exclude the periodical article from the purview of the library of the future. It is still less than a year since the *Index Medicus* of the National Library of Medicine—the largest single index to the journal literature of a single subject, listing some 150,000 articles a year, fully indexed by author and subject—achieved its present form of publication in which a computer performs the clerical functions of multiplying entries, arranging them, inserting the necessary cross-references, extracting and alphabetizing the names of the authors, dividing up the material into column length and arranging the pages, inserting running heads and page numbers, and finally controlling the photocomposing machine which prepares the printing masters. The bibliographic control of the literature of medicine has improved enormously as a result—not only through the greater promptitude and superior typography and arrangement of the monthly issues and annual cumulations of the *Index Medicus,* but also because of the improved searches of the literature which the computer makes possible, the disseminability of this improved search capability through mere mechanical multiplication of the computer tapes, and the capability of producing specialist listings without the duplication of the indexing effort which was previously necessary.

We may confidently expect similar advances in other subject fields. It is worth noting, however, that even without them, access to the periodical and journal literature has improved in the recent past and will no doubt continue to improve.

In a closely related connection, it may also be expected that the data processing mechanisms will assist in the all-important work of indexing. Indeed, they could probably do so now, were it not for the cost of converting the text to be indexed into machine-readable form. At least one experimental program for machine indexing, sponsored by the Council on Library Resources and developed by one of the speakers at this conference, found that under certain conditions machines are more reliable than human indexers. We shall certainly hear more of this.*

The library of the future will need, as I have said, techniques for enabling it to avoid deluging its customers with unwanted citations. We are only at the beginning of the development of such techniques. Some of the criteria currently employed for selection of wanted citations are date of publication, language, whether a report or a review of research, appropriateness for a library of a certain character. More criteria are needed.

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* L. F. Buckland: *The Recording of Library of Congress Bibliographical Data in Machine Form* (Washington: Council on Library Resources, Inc., 1965), x, 54p., 22 cm.

* D. R. Swanson: "Searching Natural Language Text by Computer." *Science* (Lancaster) 132:1099-1104, October 21, 1960.
————: "Interrogating a Computer in Natural Language." International Federation for Information Processing: *Proceedings of IFIP Congress, Munich, 1962* (Amsterdam: North Holland Publishing Co., 1963), p. 288-292.

I said that the library of the future will have to counter the lethargy or lack of facility of its users by calling to their attention sources of information likely to be of use to them. Thirty-five years ago a friend of mine went to work for a great chemical company. He was at that time a diligent reader of *Chemical Abstracts,* but I felt that couldn't last. I used to rib him from time to time, "How's the reading of *CA* going?" The expected happened. First there were arrears, hoped to be made up. Then, when this hope failed, my friend lowered his sights and limited his reading to fewer and fewer sections of each issue. Finally he stopped reading *CA* altogether. "What do you do for information?", I asked. "Oh," said he, "we have an excellent librarian; she knows my assignments and interests and the interests of my company, and sends me everything I need." I am suggesting here that what is good for my friend and for a chemical company is good for the individual library user—and for the country. Of course, the number of users, of subjects, and of publications is so great that if this task is to be done it will be with assistance from the data processing machines. Indeed, a well-known computer program devised by the late Hans Peter Luhn and known under the name of SDI—Selective Dissemination of Information—is already being used for this purpose in several of its installations by the International Business Machines Corporation, and perhaps elsewhere also.

I mention the need for developing other incitements of curiosity and of desire for improvement. Here I am not so sure of a technique. During World War II, when I was the supervisor of the largest library book-acquisition operation in the world, I employed an omniscient scholar, the late Dr. Sidney Kramer, to roam the acquisitions divisions looking for material likely to be of particular interest to agencies closely concerned with the conduct of the war. Hardly a day passed but Dr. Kramer reported to me that he had struck a spark in someone with material of which the recipient had not suspected the existence. I am not sure, however, that we have as yet any method that would reach the self-satisfied practitioners of methods of document restoration 135 years out of date to whom I referred earlier. The methods for reaching such people must probably still be developed.

I come to the last of my list of improvements required for the library of the future—the prompt, convenient, and inexpensive provision of copies of informational documents identified as of potential interest. I do not need to comment on the rapid progress made in the photocopying arts which in the past 20 years has reduced the per-page cost of hard copy from dollars to pennies. We have certainly not reached the end of that development. In the field of the microcopy, the microfiche has within the past two years extended the range of service enormously and laid the basis for further developments by which, as I foresee them, large quantities of seldom-used research materials will be made quickly and inexpensively available. Finally, it is even foreseeable that there may be arrangements by which copies may be procured automatically from central sources. There is, for example, no technical obstacle in principle, and probably none of an economic kind either, why I should not be able to dial a roll of microfilm in a London library, have some pages transmitted to me by telefacsimile, and pay for the service on my telephone bill.

None of the developments which I have described will very greatly strain the state of the technical arts, but they will require a much higher degree of organization for service than we now possess. It is such an organization that we are here to discuss. There is no doubt in my mind as to the direction in which we shall move as the result of these discussions. It is up.

RESPONSE:

CARL F. J. OVERHAGE
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Massachusetts Institute of Technology

IN PROJECTING a future library situation with greatly improved bibliographic access, with flexible techniques for selection, with active dissemination services, Mr. Clapp has been optimistic about the necessary technological advances. His optimism is based on deep insight; indeed, he has stimulated the creation of much of this technology by the judicious administration of financial sponsorship.

Mr. Clapp's optimism is shared, I think, by everyone who has been close to the new technology that librarians are now adapting to their purposes. Beyond the manipulation of bibliographic data by electronic computers and the rapid and inexpensive replication of documents by photocopying, there is the even more exciting prospect of procognitive systems in which a scholar's interaction with stored information is no longer confined to documents, but is carried on as a machine dialogue directly in terms of facts and ideas.

Our confident expectation that technology will provide the means for the realization of such imaginative concepts carries with it the danger that we shall expect too much too soon too inexpensively. During the next decade, librarians will have to chart a difficult course: They must invoke the new technology before their expanding operations become unmanageable, but they must avoid premature and costly attempts to apply the new technology to tasks for which it is not suitable. Mr. Clapp's choice of examples shows how clearly he has recognized this problem; for both the *Index Medicus* operation and the machine-readable "California List" illustrate the intelligent exploitation of what computers can do best today without fanciful attempts to extend their use to operations that human beings can do better.

What are the major elements of this new technology, and how do they bear upon the theme of this conference? We are asked to consider more effective means for the transfer of recorded knowledge, and the first thing we observe is that the printed page, which for centuries has been the supreme form of record, is now being used in such very large numbers that we are faced with physical storage problems. Microphotography offers a solution by reducing the bulk of stored material. Consultation of the documents at a distant location remains difficult. Transmission by messenger or pneumatic tube is practical only over short distances, and mail service is slow. Transfer by electrical signal is what we really want, and for that purpose neither printed pages nor their microcopies are convenient records. For picture material or for Chinese text, we must accept the inconvenience, but for ordinary text we can record the alphanumeric characters as binary digits on punched cards, punched tape, magnetic tape, or magnetic discs. Records of these forms will find increasing use in our libraries, especially for bibliographic data and abstracts.

Not only can these "machine-readable" records be easily transmitted over communications networks, but they can also be processed by digital machines. The marvelous capabilities of these machines have been extended beyond numerical computing into the processing of natural language, but it will be well to realize that some highly desirable accomplishments are not just around the corner. Into this category, in which experimentation rather than operational use is indicated for the next few years, I would put the recognition of spoken or handwritten text, automatic content analysis, and mechanical translation. On the other hand, there are many important library tasks that digital machines can do extremely well, as Mr. Clapp has pointed out in connection with catalogs.

The spectacular advances in digital processing have not yet been fully matched at the interface between the library system and the human user. Today's optical and electronic displays leave much to be desired, and substantial development efforts are underway to make it less awkward and fatiguing for a reader to absorb information in forms other than the printed page.

This brings me to the last of the technical requirements mentioned by Mr. Clapp: prompt, convenient, and inexpensive provision of copies. Here we have seen tremendous progress in recent years, and, with the further reduction in cost that the next decade may bring, I believe that the impact of the new replication technology on library operations will equal or exceed that of the digital machines.

These, then, are the main technological elements that are available for the design of information retrieval systems for reference and research through cooperative use of public and private resources. The toughest problems that the system designer will have to face are not the technical ones, but rather those of user habits and preferences, interlibrary organization, and economic viability.

The last of these, the all-important challenge of economic viability, makes the design of library systems a very different undertaking from the technically related problem of military command and control systems, to which Dr. Furnas referred. If the task is the defense of North America against air attack, the required information processing system is an essential factor in national survival, and the designer somehow encounters fewer questions on whether the objective is really worth while and couldn't it be done less expensively on three-by-five-inch cards?

In view of the sensitivity of the library system to user acceptance and to cost, I strongly urge that the design of the system be based on experiments which must be large enough to be statistically meaningful and yet not so large as to become an irrevocable commitment for the final design. I hope that a number of such experiments can be arranged, and I would have great confidence in an ultimate system that would be derived from those experiments.

Now I can no longer dodge Mr. Clapp's most difficult challenge: The case of John Murray and his failure to affect the course of papermaking. I regret to say that I have very little hope that even the best of the new technology will prevent a recurrence of this kind of total disregard of a valuable contribution. The opportunities for low-visibility publication have enormously increased, and the information retrieval systems of the future will have to handle too large a flood of conventional material to extend their coverage very effectively to the obscure region near the border of private communications. Worse than that, neither the librarian nor his engineer can solve the problem of the crank who is out of step with what all the experts agree is right. To give a strident dissenter his fair place in the printed public record of his field is a challenge to scholars and to society. Librarians can highlight that challenge by pointing out the consequences of intolerance, as Mr. Clapp has done so eloquently in the example of John Murray. The rest, I think, is up to each one of us in his own field.

I woke up very early this morning, and the thought of John Murray kept nagging me. Well, I reflected, this is one kind of trouble that is not encountered in military systems. And then I had a quite unpleasant afterthought: Sunday morning, 7 December 1941.

On the northern coast of the island of Oahu, there was a radar, incredibly primitive by the standards of today, but nevertheless a radar. The young and inexperienced operator of that radar saw signals that he had been taught to identify as an approaching air raid. He dutifully grabbed the telephone and reported to his superior. I don't recall exactly what the officer replied, but the substance of it was: "For heaven's sake, Sergeant, get hold of yourself and don't be ridiculous." Twenty minutes later, there was further news for that officer. This episode is now in the open; the details are in Walter Lord's book, *Day of Infamy*.

So, you see, Dr. Furnas was right in saying that the library problem and the command-and-control problem have much in common.

National and State Organization for Library Service

EDWARD G. FREEHAFER
Director, The New York Public Library

VERNER W. CLAPP tells us, in his book, *The Future of the Research Library:* "I find it inescapable . . . that if the general research library is in the future to fulfill its function, it must be able to provide its users with immediate access to local collections which will represent an increasingly significant fraction of the total available, and that it will depend less and less upon sharing of resources *unless* means can be devised to make access through sharing comparable in effectiveness with access based upon local availability."

If this conclusion is correct, then, unless we are prepared to support the local sufficiency principle by present methods through enormous expenditures for books, cataloging, and storage space, two lines of development are indicated: one, "toward techniques for increased self-sufficiency at costs lower than those at present; two, toward methods of sharing resources comparable with local availability."

This is a neat, concise statement of the nub of the situation in respect to reference and research libraries in 1965 in an exacting era of increasing emphasis on the stimulation of intellectual competence, and of the extension of scientific, commercial, industrial and other creative activity.

My specific assignment is to mention some of the activities currently proposed or advanced at national and state levels, in the search for more efficient self-sufficiency and more effective cooperative effort for the benefit of the user of reference and research materials.

During the past year, the Association of Research Libraries, consisting of 74 large academic, plus a few other large research libraries, has attempted to identify major needs and possible solutions. In its "A National Program for Research Libraries," the Association outlines the principal courses of action proposed to insure for the immediate future more effective service to scholarly research. The chief proposals, in summary form, are:

1. The establishment of a NATIONAL COMMISSION or AGENCY that has the authority, prestige, funds, and staff for leadership at the national level. Such an agency would clarify the jurisdictions, programs, and obligations of the various federal agencies already involved in informational and library activities; and would develop liaison and cooperation with non-federal libraries, professional organizations, and scholarly societies. The agency would have authority to make grants, enter into contracts, and make recommendations to the President and to the Congress.

2. RESOURCES AND PROCUREMENT. This proposal calls for expansion of the comprehensiveness of the acquisitions of the Library of Congress as a major national resource, and for the strengthening of other existing research collections to support teaching and research programs, such as new area studies requiring prompt and massive infusion of new library materials. For this purpose increased book monies are proposed, and expanded programs of photocopying, designed to make out-of-print materials available, are suggested.

In respect to procurement, trained personnel are recommended to be available in areas of the world where there is little or no organized book trade, these personnel to obtain, on the spot, currently published materials required by American scholarship.

3. CENTRALIZED CATALOGING OF RESEARCH MATERIALS. Under this proposal, the Library of Congress would be authorized not only to expand substantially the scope of its current acquisitions from foreign countries, but greatly to increase the speed of its cataloging of these materials, and to provide cataloging information promptly to all libraries requiring it. This proposal would ultimately increase from 100,000 to 200,000 the number of volumes acquired annually by the Library of Congress, thus providing far greater coverage of its collecting fields than at present, and would make cataloging information available to other libraries within one month after receipt of the material by that library. As a result, cataloging costs to individual libraries, particularly research libraries, in present circumstances required to catalog approximately half of their current foreign language titles locally, could be greatly reduced; and the constant search among individual libraries for trained catalogers with linguistic competence could be alleviated.

Further, comprehensiveness of collecting and speedy availability of cataloging information at a central point are conditions which must be met before maximum advantage may be obtained from any future system for automating bibliographic information. Thus the Library of Congress, meeting both of these conditions, would be in a more favorable position than it now is to fulfill the maximum benefit to all libraries, the focal role proposed for it in automating the bibliographic record.

4. Under the heading "DISSEMINATION OF KEY BIBLIOGRAPHIC INFORMATION," it is recommended further that a similar program of editing, conversion to machine-readable form, and publication be undertaken for the National Union Catalog. This unique record, begun in 1901, shows the book resources of a high proportion of the research libraries of the country. Local availability of copies of this catalog would greatly assist scholars and would reduce for all libraries cataloging costs for retrospective publications as they are acquired.

The National Science Foundation is exploring the feasibility of a computer-related record that would currently locate the nation's scientific and technical serial publications. It is proposed that, if it is feasible, this program be broadened to include serials in the humanities, the social sciences, history, and the arts as well.

It is proposed, also, that attention be given the preparation of a wide variety of specialized bibliographies, indexes, or abstracting services similar to those developed by the National Library of Medicine, for subject fields other than medicine, and for forms of material not now controlled. For example, a comprehensive bibliography of publications available in microtext form should be available if libraries are to take full advantage of this form of textual access.

5. SPACE. The increase in research, the upgrading in the quality of education, and the projected doubling of student enrollment in the present decade have obvious implications for library building space for new, for expanding, and for well-established institutions with stable enrollments. If physical facilities are to keep pace with the increased requirements that are being generated, supplemental funding will be required, and is therefore recommended.

6. PRESERVATION. The most promising method so far indicated for preserving physically deteriorating book papers is to deacidify the paper, and place the volumes in cold storage. For example, it has been reported that a particular book with a life expectancy of 25 years, if untreated and housed under usual library conditions, would have a life expectancy of 600 years if deacidified and stored at 34° F, and over 4,000 years if deacidified and stored at —2° F.

To preserve in original form a copy of each of the very many books in danger of being lost, and for their reproduction when photocopies are required, a national preservation and dissemination agency is proposed. In this connection, incidentally, a careful study has estimated that it would cost $10,000,000, including building, over a 10-year period to preserve physically a collection of 2,000,000 volumes, and to microfilm for use 2 percent of the collection each year.

7. TRAINING. The development of a suitable fellowship program similar to those now sponsored by various federal agencies, such as the National Science Foundation and the Public Health Service, is proposed to increase the number and to improve the capabilities of personnel entering the library and information science field.

In respect to two proposals in the program just outlined, I am pleased to be able to report some encouraging progress. On the proposal to increase the scope of acquisitions by the Library of Congress and to speed its cataloging processes, both the Senate and the House Subcommittees on Education have acted to include amendments to the Higher Education bills for these purposes.

Further, the Higher Education Bill contains provision for substantial federal aid to academic institutions for the purchase of library books, part of it for individual academic institutions according to formula, part to be used to finance special cooperative projects and to meet special needs.

Lest it be supposed that the National Program identifies enough matters to be dealt with hopefully within the next few years, a return to Mr. Clapp's book reminds us that his suggested "Programs of Research for Overcoming the Obstacles," as he puts it, includes a number of additional topics, among them:

1. Development of the techniques of high-ratio-reduction microphotography as a means for promoting local self-sufficiency of resources by acquiring additional resources in miniaturized copy.

2. Improvement of the arrangements for sharing resources so as to approach more closely the efficiency of access provided by local ownership. One notable suggestion in this regard would give to individual libraries specific assignments of responsibility. The National Library of Medicine, for example, provides a service for the literature of medicine complementing that of other libraries. Because of the comprehensiveness of this library, it is only occasionally necessary to turn to any other library in the United States for material in this subject, once the local resources have been exhausted. Union catalogs and lists are similarly to a degree rendered unnecessary in this field of literature; for most titles it may be assumed that, if they fall within this subject, they may be found in this particular library. Furthermore, this library publishes the principal current bibliography on the subject, and since this bibliography is based on its own collections, it is a catalog of them, simplifying still further their accessibility. If sources such as these were available for a number of principal subjects of inquiry, it may be doubted whether many libraries would feel the need for local self-sufficiency in such subjects to the degree they now do.

3. Search for improved techniques of book storage. As a library's collections outgrow the space provided for them, a choice must be made for relieving the pressure, whether by providing expanded space, by transferring less-used books into nearby storage or to a cooperative storage warehouse at a distance, or by abandoning the shelf classification of the collection and shelving the books compactly. It is suggested that present studies in this area must be supplemented by further study and the results put together in a guide to practice.

The list continues on:

4. Improvement of methods and codification of information regarding the storage, preservation and repair of nonbook library materials such as manuscripts, posters, maps, music, prints, sound recordings, microtexts, motion pictures, computer tape, papyrus fragments, and scrolls.

5. Prevention of mutilation and pilferage.

6. Improvement of the procedures of book acquisition.

7. Improvement in the record control of serials.

8. Improvement of record control of circulation.

9. Studies for improved building design.

10. Standardization and testing of library equipment, supplies and systems.

11. Improvement of the organization of library services. Because of the extension of the single-jurisdiction municipality into the multiple-jurisdiction metropolitan area, the generally increased need for and dependence upon reference and research resources, industry's spread beyond city limits, a growing suburbia, greater demands from students who find it impossible or inconvenient to use the libraries of their own institutions, libraries frequently find themselves under pressure from groups for whose service they were not originally planned. Thus reference and research services must be organized, if maximum advantage is to be gained from the resources of an area, and if unnecessary duplication is to be avoided.

There are obvious difficulties in reaching this objective. One of these consists of property rights and local responsibilities of individual institutions. Another is the difficulty of ascertaining where materials are located, the appraisal of their quality, and of developing the mechanisms for sharing in their use. This, I suggest, has significant relevance also for planning at the State level.

Approaches to these problems include also efforts at Statewide sharing of resources through payments, for example, to individual libraries possessing strong collections in return for extension of their services; and, as another example, development of improved techniques for providing union catalog or alternative sources of information regarding the resources of an area to persons within the area.

In 1961 the New York State Commissioner's Committee on Reference and Research Library Resources, convinced that a coordinated system for the efficient collection and dissemination of the information of mankind is needed in the interest of both higher education and industrial research, recommended State leadership in an approach, in terms of both a Statewide program and of regional programs, to the improvement of reference and research library service—programs complementary to the earlier role of the State in respect to the extension of public library service throughout the State of New York. In reference to the Statewide program, the Committee's report states in part:

> "Because a successful cooperative program of reference and research library service implies an evolving plan, including a wide variety of private and public institutions, and because so many of the problems of building such a program can be dealt with effectively only at the State level, the Committee recommends the establishment by the Board of Regents of a State Reference and Research Library Resources Board . . . This Board would be responsible for determining policies in respect to the reference and research library programs at the State level, and for guiding such policies at the regional level. Within the structure of the Education Department it would also be charged with the operation of the Statewide services necessary to the development of a reference and research library program and the approval and coordination of the programs of the proposed regional systems."

The specific responsibilities of the State Board were set forth as follows:

> Determine the needs for intensive research collections in specific subject fields and designate those libraries which would assume responsibilities for collecting in and providing service in those fields; negotiate agreements with these libraries, providing appropriate compensation for building and maintaining collections and extending their use on a Statewide basis.
>
> Identify the bibliographic tools and other machinery necessary to make the most effective use of the materials; initiate the development of such tools and machinery; and establish bibliographic and information centers to identify and locate reference and research materials efficiently and effectively. Keep abreast of technological developments and utilize whatever types of machinery are best adapted to making library materials quickly and easily accessible to all residents of the State.
>
> Assist in the development of regional reference and research library systems; designate the boundaries of such systems; establish membership requirements assuring the equitable representation of library interests of the region; approve the plans and programs of the systems; allocate funds to the systems; and guide and coordinate their programs with each other and with the total State program in the best interest of the residents of the separate regions, and of the State as a whole.
>
> Coordinate the State's program with whatever pertinent activities are planned or are taking place nationally, internationally, and among other state and regional agencies and associations.

In 1963, Nelson Associates, Inc., management consultants employed by the Education Department to examine the Statewide aspects of the proposed legislation based on the report of the Commissioner's Committee, submitted their report. A few major conclusions and recommendations, 27 in all, include:

1. Establishment of a State agency, envisaged as the operating arm of the State Board and distinct from the State Library. Some of the agency's services would be to provide the leadership necessary to establish regional boards and to coordinate their activities as they become chartered; determine which libraries in the State are best suited to serve as special subject resource centers; serve as staff to the State Board, make continuing investigations of innovations in library technology and procedures; and conduct studies in such areas as the cost of library operations and patterns of library use.

2. (Submitted as a conclusion)—State aid is required to compensate libraries for the use of their collections and facilities beyond their present service boundaries, to develop resources in depth, and to subsidize the additional staff required to serve the needs of a broader clientele.

3. In order to take advantage of the results of library data processing projects currently in development, the State agency should recruit technically competent staff. This staff should establish close liaison with the personnel of projects presently under way, should assist in the development of new projects in New York State and should coordinate these activities in order to assure widest applicability throughout the system.

I have attempted to set down here in one place some of the developments and proposals pertinent to the opportunities and, to use a hackneyed word, challenges, for the extension and improvement of reference and research library services at national and state levels. In reciting this somewhat lengthy list of proposals, I continue to be impressed by the need for concentrated effort to relate them specifically to identifiable needs, particularly in respect to higher education and to research, here in New York; to determine objectives as rapidly as circumstances permit, and in the process to assess the appropriate role of the State and its consequent opportunities for leadership.

RESPONSE:

GORDON R. WILLIAMS
Director
The Center for Research Libraries

IDEALLY, EVERY LIBRARY should be able to provide all of its patrons reasonably easily and quickly with any published information they require. Whether or not this ideal is ever achievable in any practically acceptable way—and I believe it is—it is abundantly clear that many, perhaps most, libraries are now falling so far short of this ideal as to cause grave concern.

We need look for proof of this no further than the present conference: it is obvious that it was not called because libraries are acceptably good but merely short of some ideal performance. It was called, and we are here, because libraries are unacceptably poorer than the need; and poorer not only than some small group of patrons and librarians believe they should be, but poorer than it is in the interest of the State and of the nation to permit. Not only this, but it was called in the hardly less certain conviction that means were at hand significantly to improve library service.

Mr. Freehafer's quotation from Verner Clapp's *The Future of the Research Library* does indeed, as he said, provide a neat, concise statement of the alternative means. Let me repeat them:

> 1. To make every library collection self-sufficient to satisfy all of its patrons' needs by present methods. This would require making every library at least two, or three, or more, times as large as the Library of Congress. This method is obviously so expensive as to be impractical and can therefore immediately be dismissed from consideration. Practically, then, we are left with the other two alternatives.
>
> 2. To lower the cost of books and their housing so that each library can afford to acquire and keep a self-sufficient collection—and only a complete collection of the world's literature can really be called self-sufficient. Or,
>
> 3. Enabling the individual library to satisfy most but not all of its patrons' needs from its own collection, but providing every library with ready access to a shared collection that, in combination with its own, does make it possible for every library to provide all of its patrons with any work they require within acceptable limits of time and cost.

To lower the cost of library materials and their housing to the point where every library can afford a complete collection of the world's literature seems conceivable only by some method utilizing very high-reduction microforms—photographic, electronic, or other—but no method is yet available that satisfies the economic requirements, and whether there will ever be such a method is uncertain, though I do not mean by this to imply that I think it unlikely. What I do want to emphasize is what seems certain, and that is that regardless of its physical characteristics, no microform method can be economically practical on the scale required unless a very large number of libraries make use of it so that there is a very broad base to support it. The cost to reproduce from a master, a use copy of all the world's literature within the compass of a five-foot shelf, or even of a 50-foot shelf, might well be proportional to the size; but there seems no way proportionately to reduce much, if any, below present levels the cost of making the first—the master—copy of the original material. This cost is so great that it becomes economically feasible only if it is widely distributed among a great many libraries. In other words, this apparently inherent limitation of the method makes it a conceivably possible solution only if—and this is the point I want to make—only if coordination extends beyond the libraries of even a single state and encompasses those of the nation at least.

The other alternative—that of providing every library with ready access to anything lacking from its own collection—is possible by either of two methods, or by some combination of these two. One of these methods is the assignment of responsibility for certain types or classes of materials to individual libraries that would then make them available to others. The other is the establishment of a central library, or two or three such libraries, whose sole responsibility is to collect these augmenting materials and to make them readily available to individual libraries serving patrons directly. These possibilities, though distinct, are not mutually exclusive, and can, and perhaps should, be combined in some degree. Opinion is divided as to the relative merits of the two methods, though my own view is that primary reliance on the second of these—that is, on a centralized library, or perhaps of two or three of these—will result in both greater economy and inherently better library service. But although there are two distinct methods, and different views on their respective merits, there is one important conclusion that is independent of the choice between them or of the relative emphasis given to them in combination. This conclusion is the same as that derived from a consideration of the second alternative, namely that the extent of library materials and the nature of their use makes it clear that no single state alone can afford, or needs, to be wholly self-sufficient within its own borders, but that these alternatives too require a national base.

The above remarks have considered only the problems of access to research library materials—books, periodicals, and the rest. Equally important is the bibliographic problem of description of these materials and of guides to their intellectual contents. Again the same conclusion follows from a consideration of bibliographic access as from physical access, but it follows even more clearly. Even if any single state could itself afford adequately to describe bibliographically all of the research library materials to which its citizens need access, and this is doubtful, since the same descriptions can serve all users everywhere, it would be wasteful duplication for it to do so. Coordination and cooperation in providing bibliographic control on a national basis is not only capable of providing the same control more cheaply, but practically only national coordination can make possible the complete control at every local library that adequate service to its patrons demands. And the automation of library bibliographic operations, as well as of its other purely internal operations, such as acquisition, fiscal control, and circulation, will intensify the need for national coordination and cooperation, not diminish it. The cost of programming a typist or a conventional card catalog is negligible compared to the cost of programming and providing consistent input data to a high-speed electronic data-processing system. If you are typing your own library catalog cards, it is indifferent whether you put your call number a few spaces more or less to the right or the left of what you copy; but to program the computer to do this for you differently in every library can well cost you thousands of dollars.

I do not mean to suggest that all of a state's library problems are best solved on a national basis, for this is obviously false; the organization and coordination of smaller units is also essential. What New York has already done, and is planning, on the basis of county and other regional units, and of library types, must be done both to utilize effectively what you have within the State and to take maximum advantage of what national programs can provide. But since this is a State conference, primarily and properly concerned with library service to the citizens of New York State, what I have tried to demonstrate is that the solutions to some of the largest and most difficult problems in such service can be adequately solved even for the State only by solving them nationally as well. Your own programs and planning must include as an essential element the national programs and plans if your own are to be fully effective.

The final comment I have to make on Mr. Freehafer's excellent list of present proposals for programs at the State and national level is to point out that they all are deficient in one very important respect. This is not Mr. Freehafer's fault, let me hasten to add; I suspect it is ours. The fault is that none of these programs is yet operative. They are proposals merely. They will solve no problems until they are operative, and to make them so will require work and the education of at least some legislators. That some of the proposals are embodied in bills now pending before Congress, for example, is due to the work of Mr. Freehafer, Mr. Dix, Mr. Logsdon, and others of the Association of Research Libraries, before congressional committees. But to have the bills passed will require the support of many legislators.

Regional and Local Organization for Library Service

HAROLD S. HACKER
Director, Rochester Public Library
and Monroe County Library System

IT IS AT THE COMMUNITY OR REGIONAL LEVEL that the intensive users of libraries generally begin their search for information. They may do so in their college or university libraries, if they are faculty members or students. They may start in their company or institutional libraries, if they are engaged in scientific or economic research. They may turn to their city libraries or public library systems, if they have no library facilities where they work. If they work in large metropolitan areas, such as New York, Buffalo, Rochester, Syracuse, or Albany, they will have access to the larger public libraries to supplement their college or industrial libraries. College students, in particular, do make heavy use of urban public libraries, sometimes through choice, often through necessity because of the limitations of their own college libraries.

But the use of libraries within a region by persons engaged in some form of research generally is on an unplanned, hit-or-miss basis. A large percentage of research library service is provided as a courtesy—not as a matter of right. This pattern results in inequities to the service libraries.. I know of several privately-supported university libraries in our State that provide extensive interlibrary loan and copying services on a courtesy basis to researchers throughout our State and beyond it—either at no cost or at a very nominal rate. The cost of the personal service involved in these transactions rarely is computed or included in the bill. The large urban public libraries often provide services to researchers and corporations that do not pay taxes to the governmental units supporting these libraries.

While the use of libraries by researchers within a region is without coordination and sound planning, this problem is dwarfed by the chaotic state of the collecting and service programs of the larger libraries in most regions of our State. Because of the varying organizational and fiscal characteristics of the libraries and their desire to give "immediate" service to their primary clientele, there had been little cooperative planning among research libraries within regions—until the report of the Commissioner's Committee on Reference and Research Library Resources was published and widely disseminated among our State's libraries a few years ago.

The result of this lack of cooperative planning certainly is poorer service to the research workers in the regions. In some regions, there is great duplication of expensive and often little-used materials among the libraries. If cooperative acquisition plans could be made and activated, a fair amount of money could be diverted to the acquisition of materials not currently available anywhere in the regions. Cooperative plans are needed for reciprocal borrowing privileges, interlibrary loan service, copying service, communications among the libraries, delivery service, and, above all, for fiscal equity in the service patterns that would result from such planning.

But cooperative planning is not enough! Sound plans must be activated before the researchers will benefit. And these plans must be made by a motley group of institutions: some public, some private, some non-profit, some competitive with others—but all certain to gain from the reorganization of reference and research library service within our regions.

I would like to review with you briefly the dramatic changes that have taken place among public libraries in New York State since 1948. I do so for three reasons:

1. To point out that public libraries, by working together under a State-financed plan, have materially improved and extended their services to their users;

2. To prove that cooperative library planning is feasible. Much apathy and downright hostility among librarians, trustees, and public officials had to be overcome before our present pattern of public library service was achieved; and

3. To stress the great importance of State leadership and financial support to the success of our public library program.

Back in 1949, when Governor Dewey appointed his Committee on Library Aid, to begin this whole planning process in New York State the public library picture was really dismal.

The financial support of public libraries in 1948 was grossly inadequate. The libraries' $14.4 million expenditures averaged only $1.05 per capita of the State's population. New York State contributed only $72,000 of that amount—one-half of 1 percent of the total. The combined local tax support was only $10,500,000.

The organization of public library service was just as poor. There were over 600 independent libraries, each going its own way without regard for the others. The State was chopped up into over 600 library districts whose boundaries were barriers to library service. The quality of library collections and services ranged from miserable for the majority of libraries (over 75 percent had incomes of less than $5,000 per year) to fairly acceptable in a few of the larger cities. Over 1,500,000 residents of our State had no legal right to use any public library. But the greatest indictment of all was that public library trustees and librarians had failed to formulate a program built upon the needs of library users. It was much more comfortable to limit their outlook to their own communities rather than their regions, even though their libraries' services remained substandard.

In 1950, however, the first library State-aid law was passed. This act began a new trend toward cooperative planning. For, while the law provided for a substantial increase in State aid to public libraries, it required a reorganization of library service at the regional level before State aid would be paid.

The 1950 state-aid law was materially changed, following a year and one-half study by Commissioner Allen's Committee on Public Library Service during 1956-57. The Legislatures of 1958 and 1960 enacted far-reaching organizational and fiscal changes for public libraries that were approved by Governor Harriman and Governor Rockefeller, respectively. The passage of these laws stimulated the establishment of 16 new library systems, serving 56 counties, in a five-year period: 1958-1962.

In 1963, public library expenses throughout the State amounted to almost $59,900,000—$3.63 per capita. The per capita expense had risen almost 250 percent since 1948. Local tax support had risen to $58,800,000 (compared to $10,500,000 in 1948); State support was $9,400,000—15.7 percent of the total expenses (contrasted with 0.5 percent in 1948).

All but a handful of the 600 some libraries now are affiliated with 22 library systems serving all 62 counties in the State. The number of counties served by a single system range from one to five. These 22 systems serve over 97 percent of the State's population.

This dramatic reorganization of public library service was the product of good legislation that put a premium on flexibility in the structuring and local financing of library systems. We have a considerable variety of systems now in operation. There are consolidated systems (wholly government operated), federated systems (under government leadership), and cooperative systems which are educational corporations formed by libraries themselves. Local financing is provided by single governmental units (New York City and Erie County in the cases of four systems), or by a plethora of municipal governments, including cities, towns, villages, and school districts—which is the usual pattern.

The important factor is not how systems are organized, but rather that they improve service to the public and the operations of their member libraries.

Examples of public service improvements are: reciprocal borrowing privileges throughout the system territory, eliminating arbitrary geographic barriers; permission to return books anywhere, regardless of where they were borrowed, in recognition of the mobility of our population; interlibrary loan service, enabling patrons to get specialized materials without the necessity of traveling to the central city library; better book selection; planned acquisition programs to eliminate unnecessary duplication of specialized materials; a variety of traveling book and phonograph record collections among member libraries; and a host of new services to our users.

Improvements in member library operations are achieved by library systems either through the centralization of some activities, e.g. the ordering, cataloging, and preparation of books for use; circulation control operations, delivery service, and multilith and poster service; or through in-service training and consultant services, e.g. building planning, budgeting, book collection appraisal and weeding, work simplification, and personnel management.

Future trends among New York's 22 library systems will be in the direction of inter-system cooperation, breaking down the remaining barriers between the public and good library service. A current experiment in that direction is the 4-system, 13-county program for reciprocal borrowing privileges in our part of the State. We look forward to the day when your library card will be honored by any public library in New York State.

What applications can be made from the public library program to reference and research libraries?

In my judgment, the two basic problems are identical in both areas: the need for a reorganization of the means of providing service and additional financing, including funds for personnel to plan and work at the regional level. There is need for fewer reference and research library systems than for public library systems because there are relatively few libraries that are large enough to serve as central research libraries in the regions. Perhaps five to seven regional systems would suffice for New York State.

There are several reasons why reference and research libraries should re-tool at the regional level through the formation of cooperative systems:

1. The remarkable growth of research in industrial, governmental, and educational organizations requiring advanced library facilities.

2. The growing dependence of research in one discipline upon that in another makes the small, specialized library collection less effective than it used to be.

3. The mushrooming college and university populations, coupled with the growing accent on independent learning (even at the high school level), require bigger and better library facilities in every major region of our State.

4. New York State's dual higher education program, including the private and the public institutions, will be threatened in the future, unless the larger university and other major research library collections are readily available to the faculties of the small private colleges. These colleges must compete with the larger universities for competent faculty members who will not be satisfied to be limited in access to the small college library collections for their own study and research.

5. It is far more economical and sensible to build upon existing strong libraries within a region and to compensate these libraries for services to area researchers than it would be to duplicate extensive collections and personnel in every type of institution and corporation that is engaged in research activities.

6. Finally, the present unplanned state of research library activities within our regions has brought us to the ultimate in absurdity wherein libraries actually seek

and obtain materials from other libraries more than 1,000 miles away when these same materials are stocked in other libraries within their very regions—sometimes less than one-half hour away in terms of access!

There are many more reasons why libraries engaged in research services should be working together. Let us look at the problem briefly from the researcher's point of view.

He wants to learn something that he does not know. That's his problem. The question is, how does he find out?

First of all, he must *identify* the publications that may contain the answers to his questions. To do this, he or some librarian must have access to a large collection of indexing and abstracting services and of subject bibliographies to determine what has been written on the topic of his concern and to select the journal articles, reports, monographs, or books that he wants to consult.

Then he must *locate* the libraries that stock these publications.

Finally, he must find a way to *gain access* to these publications, either directly in person or indirectly by interlibrary loan, or by obtaining copies of the articles in the publications.

How could a group of libraries working together within a region help the researcher in his threefold task of identifying, locating, and gaining access to the information that he requires?

IDENTIFICATION

1. They could develop a plan whereby the libraries would increase materially the number of indexes, abstracts, and subject bibliographies available in the region, duplicating to the greatest extent possible those of primary importance. They could also begin work on the automating of the bibliographic search within the region, as has been proposed in some of them now.

2. They could keep researchers informed of current acquisitions in fields of key interest to the area through a publications program, automated in part, at least.

3. They could provide literature searching services to researchers if they or their employers were willing to purchase such services.

4. They could work together to assure the region an intercommunication with future automated networks that will provide bibliographic and information services on a remote basis to supplement the resources of the region.

LOCATION OF MATERIALS

1. These libraries could plan and implement a systematic program for the acquisition and storage of a maximum number of materials of major significance to the research needs of the region. Such a plan could minimize unnecessary duplication of infrequently used materials, disclose gaps and weaknesses, enlarge the region's resources, and make the most effective use of the funds available for the purchase of library materials.

2. They could inform the researchers of the location of materials within the region through the publication of union lists of journals and serials and of descriptions of major subject collections within the region.

ACCESS

1. They could permit direct access to all libraries by researchers, including reciprocal loan and closed stack privileges.

2. They could make their materials quickly available to the researchers within the region through an automated communications network, rapid delivery service, or fast copying service, or a combination of any of these.

3. Their interconnection with future automated networks would also serve to extend the access of the region, the people in the region, to the whole State and the nation as it developed.

None of these regional programs is likely to get far off the ground without able staffs working at the regional level on a full-time basis. Such personnel would have the responsibility for determining the priorities in research library needs within the region for planning programs to meet these needs, for recommending libraries to provide specific services under contract, and for offering in-service training programs for library personnel.

New York State has a great opportunity to gain leadership in the nation by marshaling all of its research library resources into Statewide and regional systems. It has achieved such leadership with its public library program.

To achieve this goal, New York State must recognize the vital importance of library service to the research activities in our State and commit itself to a legislative program to make such a cooperative program a reality. The legislation must provide for the formal structuring of cooperative organizations at the State and regional levels and the money to finance the programs. Fortunately a legislative blueprint, spelling out these requirements in detail, is available as a result of the work of Commissioner Allen's Committee on Reference and Research Library Resources.

As a first step in the implementation of this program for New York State, I recommend the formation of the State reference and research library advisory board and of regional reference and research library systems. These would be at the policy-making levels.

Secondly, the appropriation of funds for the staff and for some services at the State level and at regional levels. The staff would be responsible for detailed planning of the Statewide and regional programs and services through consultation with the people in the field, both the consumer and the librarian. The interplay between the State and regional planning staffs in this process would be most important. They would be responsible for initiating as many cooperative services as funds would permit.

Finally, I recommend the preparation of a service and fiscal blueprint for future needs at both State and regional levels.

RESPONSE:

DR. RICHARD H. LOGSDON

Director, Columbia University Libraries

IF THERE IS A POINT OF disagreement, with the panelist, it is in his use of the word "chaotic" in describing the development of our research collections. Under present governmental arrangements, and I use this term in a broad sense, the first and primary responsibility of the librarian of the research library, whether within a university or outside, has been and is to provide the collections and services necessary to meet the demands of a particular clientele. Librarians of these collections accordingly have been free neither to extend the boundaries of their responsibility, nor to force segments of their reader population to rely primarily or exclusively on other collections.

I am in full agreement that a system's approach to library planning must begin at the local level, and with an assessment of the full range of reader needs—students, faculty, research personnel, and citizens generally. That the total range and intensity of these needs for information exceeds the capacity of our libraries is, I believe, now generally accepted.

In a 1957 survey of the Columbia University Libraries, it was stated that "judging from the opinions of faculty, students, and library staff, there is no predictable upper limit to Columbia's library requirements. Almost any journal, monograph, document or manuscript . . . has an actual or potential use in the modern university." Since that time we have added at least 750,000 cataloged volumes and probably as many as 2,000,000 different pieces of material. Nevertheless, even with these enormous additions to resources, I found it proper to say in a recent conference that "there is probably no field of specialization at Columbia in which some member of the faculty could not identify source materials important to his work which were not available in the Columbia collections."

The same situation, I am sure, holds, not only for other university communities but for colleges as well. Academic excellence is based on specialization, and the college teacher, as well as the full-time research scholar, must keep up with the new knowledge of his field, as well as continuing his own research, if he is to do his job properly.

Similarly, the practicing lawyer, doctor, or other professional person must have ready access to a very wide range of highly specialized source materials if he is to keep up-to-date with the new findings of research. Their counterparts in research organizations or in the research departments of corporations likewise find their information requirements becoming increasingly varied and complex, to the point that specialists in information handling, itself, become necessary.

But in emphasizing the larger requirements of today's students and scholars, we must not lose sight of the necessity for strong local collections. Most needs at the local or institutional level must be met by the individual college, university, or special library. In general, it is only with the more specialized research materials that cooperative efforts will prove fruitful. It would be a grave mistake indeed to think that the creation of a regional, state, and eventually a national network of library services would eliminate the need for first-rate local services.

Coordinated regional and State plans, on the other hand, should concentrate on those services which either (a) need to be provided only at the regional level; or (b) can be provided only at the regional level. This might very well mean that only the larger or the more highly specialized collections would be involved formally in a coordinated plan for meeting the so-called reference and research library needs of the State. These larger and stronger collections would serve as backstop or umbrella libraries, supplementing local resources. The primary objective, in any case, is to identify those resources, services, and facilities which need be provided only in one place for a particular population or reader group. By getting "more mileage" from each copy of a book or other material, it is possible to provide a wider range of material within a given budget. Conversely, with fewer copies in the system (and in some cases only one), some convenience is bound to be sacrificed unless corrected by improved systems of communication.

Our objective in this segment of the conference is to promote the cause of better local and regional planning. In all candor we must admit that librarians and others have been giving a lot of attention to this question for a number of years. Discussions in the modern period began in the New York City area in 1946 with the formation of a New York Metropolitan Committee of Librarians. References have already been made to other groups which have pursued the problem since, including the Regents' Committee on Integration of College and University Library Resources, the Commissioner's Committee on Reference and Research Library Resources, and more recently the Ad Hoc Committee of Librarians in New York City, 1962-63.

But why has there been so much discussion and so little to show in the way of concrete progress? It was Virgil, I am told, who once said, "Happy is he who has been able to learn the cause of things."

For the purposes of this conference, I would venture to identify at least two probable causes for our lack of progress to date:

1. Failure to define with sufficient precision the goals appropriate to cooperative ventures;

2. The absence of any agency, private or governmental, with sufficient authority to develop and to sustain a program of library cooperation.

A proper systems' analysis of the library operation will reveal a very wide range of kinds of services. "Good" library service means different things to different people. There is a vast difference between a library supplying the instructional needs of an undergraduate student body and the collections in breadth and depth necessary to support an area's studies program relating to Eastern civilizations. Some of these services are best provided at a local institutional level, others at a community or regional level, still others at the state level, and possibly a number of services are provided most efficiently only if done in one place for the nation as a whole, or for that matter, internationally.

We have, in my opinion, oversimplified the nature of the library operation and the ramifications of good library service. We have been too prone to use analogies and to cite examples from other fields. The airlines reservation system, involving the use of computers, as described by Chancellor Furnas, probably does its job very well indeed, and may even involve some techniques which are applicable to the library and information world. But there is a vast difference between the management of identical seats on a prescribed number of flights by a limited number of varieties of planes. Suppose I want the window seat just after the wing on the port side of the plane. I am sure that a system could be devised to make reservations this specifically; it would probably complicate the process four-, eight-, or 16-fold. Similarly, in these discussions we have heard references to the wonders of the telephone system. Chancellor Furnas offered us an example here also: that, if we were relying on equipment of the vintage of only 20 years ago, there would not be enough women in the population to staff the switchboards. But the important difference of the whole telephone system, locally, regionally, and nationally, is that the system merely carries information generated by the user. In other words, there is no loading problem, whereas in the library and information world this is precisely the source of the high cost and the difficulties.

We have, in effect, oversimplified the environment in which we are working. It is the time for more discriminating definition of goals, and for the kind of research in communication theory being developed by Professors Overhage at MIT, and Mesthene at Harvard.

On the other hand, to view the problem as insoluble would be an equally serious mistake. It is possible within an interim period to identify particular areas where action programs are feasible and the benefits substantial. I should like to cite the example of the cooperative cataloging program developed by the Association of Research Libraries during the last 18 months, which, in a relatively short time, with the participation of appropriate groups, has been carried to the point of an amendment to the Higher Education Act of 1965. With an appropriation of only $5,000,000 it would be possible for the Library of Congress to double its acquisitions and its output of bibliographical information, to the benefit of research libraries throughout the country and throughout the world. Here is a clean-cut example of a task, bibliographical description and subject cataloging, which can be done most efficiently at a central place, and of a program to provide just this kind of service.

The second reason enumerated for a lack of achievement in the area of library cooperation, particularly in New York State and in the various regions, has been the absence of an official agency charged with the responsibility. When a program of service cuts across political boundaries within a state or across state boundaries, or if it involves a combination of public and private institutions, as is true in the library field, then there is a need for a corporation or governmental body capable of taking the initiative in planning, financing, and executing appropriate programs. This has been, of course, a fundamental feature of the New York State Plan for Reference and Research Libraries. The New York metropolitan area has already taken positive action in the creation of the New York Metropolitan Reference and Research Library Agency, and it is precisely this kind of need which supports Mr. Hacker's final recommendations.

In conclusion, I should like to make four quick points. If they are similar to the four points made recently at the meeting of the Special Libraries Association in Philadelphia, it is because the subject has been the same.

1. We have, in my judgment, been misusing the word "cooperation." What we are out to achieve is more effective *sharing* of the totality of library resources within a given community or area.

2. A system's approach to the handling of library and information services is a precondition to the achievement of any program of effective sharing.

3. This will be possible only if there is an appropriate governmental structure.

4. Government is really a matter of politics in the good sense; it behooves librarians in the years ahead, individually and through their associations, to become more political and, hopefully, more politically effective, in persuading the state legislatures and the Congress to take appropriate legal action.

Discussion Period

FRANCIS R. ST. JOHN

Chairman

IT MIGHT HELP in focusing the discussion if I summarize the kind of thing that has been said in these two days.

First, we have heard over and over again that there is a problem. There is a need for access to the materials from the standpoint of both a healthy industrial climate in the State and of aid to education. We have been told that the materials within the State at the research level are spotty. They are usually in the urban areas of the State. We have been told that in the pattern of today's living our people are moving away from the poor cities into the suburbs, industry is moving into the same suburbs pulling people with them. This is moving away from the source of the materials and there is not yet time, and there probably never will be time in the years that we can foresee, for building up the kind of collections that are needed in those areas.

New universities are being built very rapidly in this State, they have to get land that is open, and therefore they, too, are moving away from places where we have the collections.

We have been told over and over again in these two days that planning is necessary. A cooperative type of collection and use of materials is necessary. We have been warned that the materials are spreading so rapidly that no longer can any individual library collect the materials, but there must be cooperation. The planning should be on a broader base than what we have had so far, because we are scattered and we have to think in terms of larger units for planning than we have had in the past.

We have been warned over and over again that while the new developments in the field of electronics, data processing, and so forth, are very important, we should study the economic feasibility of the methods of doing things at various levels of library services. Consequently, we have also been told several times that the methods of paying for this must be on a broader base than what we have had in the past. This means first at the State level, and then probably at the national level as we spread out and have to have a broader plan.

We have been told that the things we are looking for, are location of materials that are needed, communication to make sure that those materials can be obtained and are accessible either in duplicated form or in original. We are told that as far as our planning is concerned, it should be tied in with developments at the federal level if we want to consider the future economic feasibility of these plans.

In the ensuing general discussion, the following points were made from the floor:

The suggestion was emphasized that the proceedings of the conference be published and given wide dissemination.

Mention was made of the possibility of a series of regional library conferences in the State as a follow-up to this one.

One delegate urged a longer view towards library cooperation with other countries of the world ("predictable within 10 years").

Another said that more consideration should be given to the *whole* problem of communication, including agencies other than books; and lamented the "breakdown in the use of the English language."

It was pointed out that some important research materials are closely guarded, by research organizations and universities in contract with government programs. How could they be drawn into a cooperative research library program?

The question was asked: why has the Legislature been so "reluctant" to act on the reference and research library proposal? A reply was given by Harold S. Hacker, saying in effect: No great ground-swell has developed for it, partly because it is a "more sophisticated" program than that of public library service; also a much more complicated one. It will take time and patience. There is a far greater understanding of the proposal now than even two years ago.

On the same point, other commentators pointed out that little has yet been done to inform the people of the State what it is about; that it is going to cost a great deal of money for the whole program, and the State cannot be expected to "pick up the tab overnight" for a job that will take years to accomplish. The suggestion was advanced that it be undertaken on a piecemeal basis, and that priority guidelines be set. During the last four years, "we have, for the most part, been talking to ourselves." The proposal has won a little attention from the Legislature and a few government officials, but a good deal more cooperation is needed among library interests themselves. "We must talk about it, as groups, as individuals, as citizens," in order to spur action. This kind of use of library facilities has to be explained to the people. Also, there is a need to find out more about how people use libraries.

A resolution was adopted unanimously recommending to the Governor that he consider extending the life of the Advisory Committee for the Governor's Library Conference.

CLOSING PLENARY SESSION

Presiding: **THE HONORABLE FRANCIS BERGAN**
Associate Judge
New York State Court of Appeals

Summation of the Conference

DR. WILLIAM J. RONAN

Secretary to the Governor
Chairman of the Advisory Committee for the
Governor's Library Conference

Summation of the Conference

DR. WILLIAM J. RONAN

Secretary to the Governor and Chairman of Advisory Committee for the Governor's Library Conference

THIS CONFERENCE WAS CALLED to explore the problems of and the demands on the library of today; and the methods and the techniques for improving the library as a principal source for the collection, storage, and retrieval of information. The Governor's reasons for calling it were several-fold.

First, the vital role that the library, as a repository of information, as a collector of information, and as a purveyor of information, plays, not only in education, but in the cultural, social and economic life of the State. The State is engaged in a consistent and prodigious effort to improve its rate of economic growth and development, and the library has a most important role to play in this respect. We are in a measure converting some parts of the State from what might be called the early 20th century type of production, of heavy industry, into the more highly electronicized type of industry. Hence so much more importance has been attached, not only in terms of the political and social life of the people, but in terms of economic development of the people, on education through the expansion of higher education and, of course, elementary and secondary along with it. This means that attention must be given to the library in a dimension that has not heretofore been given.

Secondly, the Governor was building, of course, upon the pioneering work done by many in this room, including Judge Bergan, our chairman of today, and going back to Governor Dewey's starting the process which has really brought us here today. The purpose of this meeting was, as the Governor viewed it, an attempt to get a gauge as to just what is the major focus in terms of problems that the State should be concerned with, so far as the library is concerned.

Your committee developed a program in which you have witnessed the confrontation of the consumers of information—that is, the educators, the scientists, the humanists, the industrialists, the government officials—with the librarians, with the purveyors of information, the storers of the information, the catalogers of information. Thus we have had an opportunity for the consumer point-of-view to be represented in order to critically examine the library, the validations of present library service. And the librarians have had an opportunity to respond, making realistic appraisals of their methods and techniques, and the future methods of meeting the problems which are presented; and also to put back on the consumers, in a sense, some of the burden which the librarian has been carrying, namely the burden of economic cost of trying to provide the kind of dissemination of information we need.

In Panel One, which stressed the consumer's point of view, Dr. Fischer brought home the implications of our new concern about universal education; the dimensions of equal opportunity in our educational process. He indicated some of the impact of this upon libraries. He also mentioned, as have many, the incredible increase in available information. He shared with us, briefly, the changing spectrum of curricula in colleges and universities, new ideas, the organization of knowledge, the changing patterns in educational methodology, and how these may affect the library. He gave special stress, as others have since, to the doctrine (if we may call it such) of "student teach thyself," which has more and more characterized some of our departures in higher education; placing emphasis upon individual student research and making the library a focal point to an extent that it has not been before in both undergraduate and graduate education.

Dan Lacy drove home the fact that the problems of education and the problems of libraries are coterminous, really; that the school libraries are becoming the core of instruction, not just a necessary adjunct, and certainly not a luxury. He reminded us that, not only has there been an enormous expansion of data, of information, of knowledge, but there has been a tremendous explosion of population; and this explosion of population has brought to the colleges and universities an unprecedented number of students and a mass demand on library facilities for which libraries had not been prepared. Mr. Lacy also expressed the point-of-view that satisfactory undergraduate library service can be provided with a fairly limited number of titles insofar as direct instruction is concerned, but that research library services present a very different problem. He warned us that automation, the automatic information retrieval devices, while they will be helpful, can solve but some of the problems, certainly not all.

Dr. Mesthene talked about the transfer of technical knowledge from the specialists who generate it to the decision-makers who must use it. He stressed that communication is essential, not only among the experts, the scientists, but also that we must have transfer of this information from the expert to the layman. He pointed out that we are devoting some 80 percent of our efforts to generating information and about 20 percent to transferring it; and yet decision-makers need to have available to them the information developed by the technical specialists, information so important to be transferred quickly in these days of rapid movement—social, economic, political, and technological. He stressed the need for manpower in this field to help in the transfer process, and challenged us to examine what training of such manpower should entail. He talked about the importance of information centers that could serve as vehicles for not only amassing this information, and circulation of information among experts, but translating or transferring it to the lay decision-maker. I am sure we would all like to hear from him, or from someone equally stimulating and competent, another paper on the feed-back from the layman who must make decisions, back to the expert.

Dr. Dix, who responded, observed that the availability of technical information is perhaps more crucial than the transferability itself, at least in terms of emphasis. He gave great stress, which we appreciate, to the activist role of the library in making information available to the potential user.

Dr. Furnas gave us very specific examples in industry, in science, in education, and in government, of the application of automatic data processing methods in airline reservations; the automated library at Florida Atlanta University; the defense demonstration area; the *Index Medicus;* the Roswell Park Cancer Center in Buffalo, with the use of the medical abstracts by the staff; and with the development of the intercommunication establishment underway now in and among the universities and here in the State INTERCOM. He talked, directly to the point, of the role of the library in INTERCOM, and he gave us a visual image of how the student might use electronic data processing in the future.

Dr. Swanson, in response, kept our feet firm on the ground, reminding us that one of the principal reasons for automation is economic; and that information systems must serve the needs of users—this is the test. The information system must not merely reflect the goal of the designer; just as a building has to please those who occupy it, not merely the architect. He reminded us also, gave us a little historical perspective, that we have lived with expansion of information over a few centuries, and thus far have managed to survive, so that we may look forward with a certain amount of hope.

In his banquet address, Dr. Adkinson, in an incisive paper, indicated that the frightening pace of technical advance is affecting our libraries; but not only the libraries, but the very community the library is designed to serve. We not only have an increase in information and changes in the character of information, but we have the swift change in the character of readers' needs and interests. He reminded us that planning must be in the direction of meeting this consumer need. He talked as did others, about the problem of vertical interdependency—federal, state, local, horizontal interdependency. And he gave us some guidelines for possible separation of function, national, state, and local, in terms of responsibility. He made an eloquent plea for the relaxation of legal and administrative restrictions which hamper the articulation between the various types of libraries, so that they might more freely supplement each other; and that we might have available to the consumer the plenitude of the resources that exist. He pointed out that there will be need for new types of manpower, as did others who had spoken before. Certainly, as the library changes we are going to require more and more trained and technical manpower in the library field, as in so many other fields of social and economic endeavor. Dr. Adkinson made the significant observation also that the computers have a great contribution to make, but, as others have indicated, they are no panacea. They have their immediate real promise in taking care of the clerical routine, or the repetitive operations. He gave a wise caution that the premature introduction of technical automation innovations at state and local level could possibly lead to wastage or dislocation; and he asks that we pay due attention to national services which are developing and look toward the integration of state and national services.

Verner Clapp impressed upon us not only the fact that John Murray had a very considerable amount of information which we all could have used a long time ago, which had been lost; but also the enormous quantity of available information in our libraries that is not being made available to potential users. He gave us a succinct diagnosis of the inadequacies of our current library methods and techniques, and told us that the remedies of automation and electronic data processing can help us achieve improvement in bibliographical access, much more selective access to information, more effective methods of notifying users regarding the existence of information. I would say also that he impressed on us the versatility of the data processing machines, the wide variety of possible new applications for machines now in existence, and the promise that these machines and successive generations of machines offer for improving library service, information storage and retrieval.

In his response, Professor Overhage cautioned against expecting too much, too soon, and at too low a cost, from automation. He indicated that there are very many important library tasks that digital machines can do, and do very well, but there are tougher problems. Professor Overhage told us there are matters of user habits, existing organization of libraries, and the economic costs. He urged upon us the use of experimentation, pilot programs, so that we would be proceeding with more knowledge, more testing, before we embark upon grand designs for electronic data computers without adequate tests.

Dr. Freehafer told us that the essential question involving the organization of national and state library services is finding the means of acquiring the basic materials that the individual research library should have; as against the ideal that has been articulated many times, that of the library having everything. He gave us a very succinct review of significant activities currently proposed at the national and state level for improving reference and research services. He mentioned as desirable the establishment of a national commission or agency to clarify relationships between federal and state agencies; the strengthening of national and state library resources through centralized cataloging by the Library of Congress; and the dissemination of key bibliographic information from the national union catalog.

Dr. Freehafer indicated to us some of the range of studies that have been made in New York by the Commissioner of Education's Committee on Reference and Research Library Resources, the study of Nelson Associates and others, on the development of organizational arrangements for improving reference and research projects.

In response, Gordon Williams observed that we are falling far short of the ideal of providing the materials needed by all the users of library resources. While he commended us for effort on the State level and encouraged us, he also admonished us that national centralized library services can be of an inestimable value, and told us that no state library system can be, or should be considered, completely self-sufficient. He encouraged us, however, that the solution of library problems here in New York State at State level can be a great assistance at the national level.

Harold Hacker turned our attention to the organization of library resources for more effective collections, storage and retrieval at the regional and local level. He emphasized that we have a need in this State, about which we can do something, for the planned coordination of libraries to achieve greater equity in making information available to research at the local level throughout the State. After reviewing some of the changes that have taken place in the development of libraries since the key year 1948, and giving due credit for what progress has been made, Mr. Hacker made a plea for more effective organization of reference and research libraries at the regional level; and he recommended the formation of a State reference and research library advisory board, and of regional reference and research library systems.

Dr. Logsdon, in response, indicated that our demand on the resources of research libraries generally exceeded the ability of the libraries to make the information available; and that a more effective pooling of our resources, regional, State, and federal is essential. He cautioned, however, against oversimplifying the task ahead. He encouraged us among other things to get a better understanding of consumer reader needs.

In the discussion period it was suggested that, first of all, we disseminate the proceedings of this conference. It was also suggested that there should be a follow-up within the State with regional conferences. In the discussion mention also was made of the possibility of attacking this enormous problem that is before us by dividing the task into subject-matter areas, as has been done in the medical field, with the *Index Medicus*. This would mean perhaps an approach in the social sciences, economics, the physical sciences, and so on.

In our panels of the past two days and in the discussion, there were clearly emergent guidelines for the development and more effective utilization of our information resources. There has seemed to be consensus that national effort, which is underway and which shows some promise, needs to be further stimulated; but definitely an emphasis that State leadership is essential.

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